

your own back-yard putting green Page 66

Foil thieves:
**TAKE-IT-WITH-YOU
CAR TAPE MOUNT**

Page 111

Popular Mechanics

AUG. 1972
50 CENTS

**15 GREAT IDEAS
FOR BETTER
OUTDOOR
LIVING—**
any one of them
will make your
back yard sing

Page 61

**BUILD THE
LITTLE DUTCH BARN'**
Perfect storage
house for all the
things that
crowd your garage

Page 64

**Bench-saw know-how
that gives you professional results** Page 144

Owners report on Dodge Charger and Saab 99



Isn't it nice to know
that while you're
taking care of her,
High Seas is taking care
of your face?



Sometimes you don't
have time to take care of your
face the way you should.

To protect it against
the things a face runs up
against during the day.

Well now you can
with High Seas, the new
conditioning after shave.
High Seas has emollients.

It feels different than
other after shaves. These emollients
soothe and smooth your face and
help keep it from drying out.
High Seas®. The new conditioning
after shave. It takes care of your face.
While you take care of other things.



Is there a pump action shotgun that actually helps you stay on target? Shot after shot?

Yes. The Remington Model 870 "Wingmaster" is designed to do just that. Here's how and why.

Hunters don't always have a chance to get set for a shot. If a covey flushes without warning or the ducks suddenly veer from the decoys, the hunter has to go into action fast. That's when proper shooting techniques pay off.

A good hunter should practice shouldering his shotgun until getting it into position becomes a reflex. Always bring the stock to your cheek, as shown in the photo below, rather than your cheek to the stock. Keep it high enough on your shoulder so it isn't necessary to strain your neck muscles getting a good sight picture.



It's a good idea to wear your regular hunting clothes when you practice, especially if your jacket is thick or bulky. Then you'll be sure your shotgun "fits" properly when you're out in the field. And if it's a Model 870, you'll find it's balanced to swing smoothly and point fast.

So much for the first shot. But what happens if you have a chance for a double, or the bird you miss is still in range? That's when the 870's pump action comes to your aid.

Here's a tip from Remington experts. Recoil tends to force a barrel up and back. The 870's pump action actually lets you make use of this force to help bring the fore-end back to eject the hull. Then the forward motion of your hand, which chambers the next shell, helps you bring the gun back on target, ready to shoot, with no wasted time. Thus, your natural reactions to recoil help keep your shotgun under constant control... to help you get set for that second shot as quickly as possible.

What's more, the Model 870 has two separate action bars—one attached to each side of the fore-end—that let you pump

it much more smoothly, shot after shot, without twisting or binding the action. That's double insurance it will feed and eject properly under all shooting conditions.

If you have any doubts about the dependability or handling of the 870, visit any trap field and you'll find it's a favorite with trapshooters everywhere. Remember, a trapshooter can fire four or five thousand shells a year, or more—and he wants a gun that can take it. No wonder the Model 870 is the leader in the pump action field.

Another advantage of the 870 is that it is made in five gauges and has interchangeable barrels (within gauge and chamber length) with different choke and barrel-length combinations to suit different types of hunting. You can change the barrels yourself. In 12 gauge alone, you can choose from 21 different barrel-length and choke combinations.

If you hunt game that requires long shots, take a look at the Model 870, 20 and 12 gauge magnum models. They can shoot all 3" magnum shotgun shells, 2¾" magnum and high- and low-base shells, giving you a large selection of different loads.

This year we've brought out three new Model 870's; a 20 gauge lightweight in standard or magnum; and a special high-grade "All-American" Trap Gun.

We also have a regular left-hand model for southpaw shooters in 12 and 20 gauges. Right-hand Model 870 prices start at \$124.95*. So if you're looking for a dependable fast-handling pump that's adaptable to different kinds of game, be sure to look at the 870. Better yet, handle one and use either Remington or Peters ammunition to make sure you get the most out of it. Our patented "Power Piston" one-piece wad helps put up to 10% more shot in the pattern compared to old-style wads.

Remington Reports are based on information supplied by "Remington-Peters" experts. If you'd like a free copy of our 1972 catalog, send a postcard to: Remington Arms Co., Inc., Dept. 540, Bridgeport, Conn. 06602.



Each receiver is machined from a solid piece of steel giving the 870 extra strength to handle powerful magnum loads. A solid steel block with the first few cuts is shown at the top; a finished receiver is on the bottom.



shooters in 12 and 20 gauges. Right-hand Model 870 prices start at \$124.95*. So if you're looking for a dependable fast-handling pump that's adaptable to different kinds of game, be sure to look at the 870. Better yet, handle one and use either Remington or Peters ammunition to make sure you get the most out of it. Our patented "Power Piston" one-piece wad helps put up to 10% more shot in the pattern compared to old-style wads.

Remington Reports are based on information supplied by "Remington-Peters" experts. If you'd like a free copy of our 1972 catalog, send a postcard to: Remington Arms Co., Inc., Dept. 540, Bridgeport, Conn. 06602.



Model 870.

Remington® OUPONT PETERS™

Great guns deserve great ammunition. We make both.

*Price shown is suggested minimum price, subject to change without notice.

"Remington", "Peters", "Wingmaster", and "Power Piston" are trademarks registered in the U. S. Pat. Off. "All-American" is a trademark of Remington Arms Company, Inc.

This One



CKHL-1P6-KSHH



The two family car.

The great American dream used to be two cars in every garage. But INTERNATIONAL changed all that with the new SCOUT® II.

The new Scout II lets you be two families in one (weekday and weekend).

All week long the Scout II works just like the rest of your weekday family—going to the station, supermarket, cleaners and school. And that's where the

fold down rear seat for extra carrying space comes in mighty handy. Of course, so does the smooth ride and optional creature comforts like automatic transmission, air conditioning, power steering and power brakes.

But come the weekend, the Scout II is as ready to play as the rest of your weekend family.

The Scout II loves to go fishing, skiing, hunting, camping or just exploring.

And with four-wheel drive you'll discover a lot of fun begins where the road ends.

So when you stop and think about it, you really don't need two cars do you?

In fact, you don't need a car.

You need a Scout II.

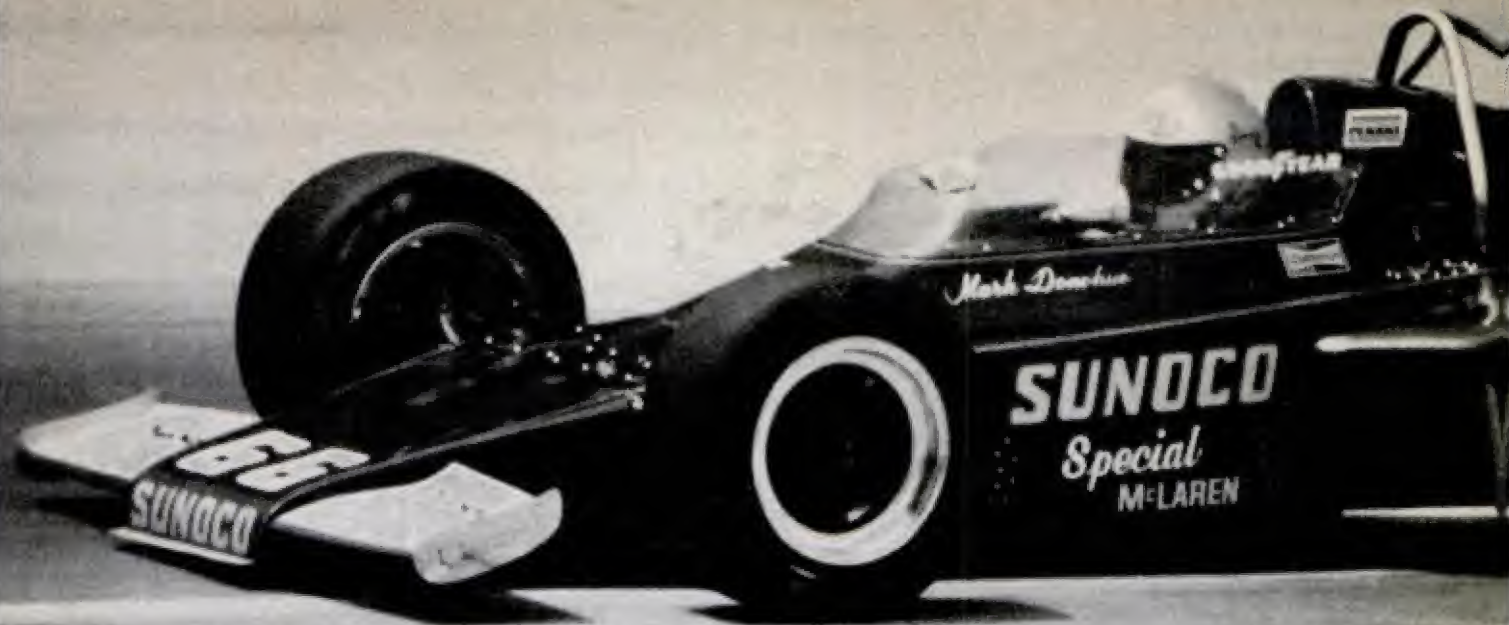
The one for both of your families.

Get 'em up Scout!

Scout II

International Harvester Company, Chicago, Illinois 60611





Indy. All you have to do is win.

Amazing race.

For example, if you're the driver, go 214 miles an hour and turn sharp left.

One car had eight of the most carefully built, finest-in-the-whole-world, \$30,000 racing engines virtually self-destruct, just trying to get in the race.

We make spark plugs for

just about every kind of racing engine in the world. So we know. Indianapolis is a hard race.

This year we celebrated our 34th win by coming in first, second and third. (That's Mark Donohue in the Penske-McLaren Turbo-Offenhauser above, winning.)

Finally, for the hard core,

the night before the 500, Duane Carter, Jr. won the feature midget at the fairgrounds. In a Sisco Chevy with Champion plugs.



Toledo, Ohio 43601

20 million people have switched to Champion Spark Plugs.

Champion Spark Plugs is a registered trademark of Champion Spark Plugs Company.

HOW TO...

Make a back-yard
putting green 66



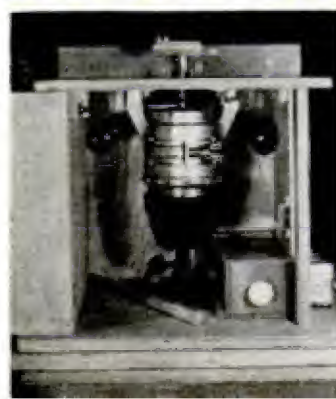
Build a rolling dolly
for photo lights ... 14



Safeguard your car's
stereo tape deck... 111



Convert your router
to a 'shaper' 138



AUTOMOBILES, DRIVING

- 16 New for your car
- 32 Two trail riders from Attex
- 40 1972 Urban Vehicle Design

Competition: They plan to win with hydrogen

- 56 Drivin' with Dan
- 82 PM Owners Report: Dodge Charger
- 91 8000 miles in a Model T camper

- 106 PM Owners Report: Saab 99
- 116 PM takes a ride in tomorrow's bus today

- 122 Saturday Mechanic: Fix your own alternator

ELECTRONICS, RADIO, TV

- 36 New in electronics
- 100 \$700 receiver in \$400 kit
- 102 Coming: TV cameras you can carry in your pocket
- 111 Slip it in—slide it out (car tape-deck safeguard)
- 119 Don't let those brownouts become burnouts

PHOTOGRAPHY

- 14 Build a rolling dolly for your photo lights
- 152 New in photography

EVERY MONTH

- 6 Letters
- 18 All Outdoors
- 22 Detroit Listening Post
- 28 Science Worldwide
- 42D Appliance Clinic
- 46 Automobile Clinic
- 50 The Bicycle Shop
- 60F Homeowners' Clinic
- 104 New Inventions

HOME AND YARD

- 61 15 great ideas for better back-yard living (A 20-page roundup)
- 126 Better ways to do it
- 129 At last—a new paint can
- 150 Exciting new products

SHOP AND CRAFTS

- 128 Hints from readers
- 130 Things to keep your workshop humming
- 135 Standing jig turns out perfect wooden wheels
- 136 Hints from readers
- 138 Your router can become an 'instant' shaper
- 143 Lightweight saw with a heavyweight punch
- 144 Bench-saw know-how (Part 2)
- 154 Octagonal lamp table: a beauty, simple to make

BOATING, OUTDOORS

- 94 A paddlewheel riverboat
- 158 Sailing faster than the wind
- 164 Story behind the stern drive
- 168 This outboard is sprightly at 50

SCIENCE, INVENTIONS

- 86 Electronic 'eyes' let the sightless 'see'
- 104 Coming: A 'flying saucer' that really flies

SPACE, AVIATION, MILITARY

- 98 Sidewinder: pretty, perky performer (homebuilt plane series)

Cover photo by Frank Aleksandrowicz, Black Star
Dutch mini-barn built for \$400—One of the 15 great ideas for better outdoor living presented on pages 61-80

AS A SERVICE TO READERS, Popular Mechanics publishes newsworthy products, techniques and scientific and technological developments. Because of possible variance in the quality and condition of materials and workmanship, Popular Mechanics cannot assume responsibility for proper application of techniques or proper and safe functioning of manufactured products or reader-built projects that result from plans published in this magazine.

JIM LISTON

Editor

SHELDON M. GALLAGER **JOHN A. LINKLETTER**

Executive Editor

Managing Editor

WAYNE C. LECKEY

Home and Shop Editor

ALVIN KIETZ

Art Director

Published by The Hearst Corporation

RICHARD E. BERLIN, PRESIDENT

RICHARD E. DEEMS

President, Magazines Division

JOSEPH F. KERN

Publisher

BILL HARTFORD.....Automotive
JOHN F. PEARSON.....Science and Engineering
WM. T. McKEOWN.....Boating and Outdoors
IVAN BERGER.....Electronics and Photography
HARRY WICKS.....Home Workshop
MICHAEL LAMM.....West Coast
ROBERT LUND.....Detroit Automotive
GARRY WINTER.....Copy Chief
RICHARD H. FUNK.....Production
ALFREDO VEGA.....Assistant Production
DON EVANS.....Technical Art Director
FRED A. LEERS.....Assistant Art Director
JOSEPH P. BEATON.....Assistant Art Director
DAVID KOMITAU.....Assistant Art Director
CLIFFORD B. HICKS.....Special Projects
SOPHIE GRONOWICZ.....Director, Bureau of Information
EVERETT JOHNSON.....Cabinetmaker

ADDRESS ALL EDITORIAL COMMUNICATIONS TO: 224 West 57th St., New York, N.Y. 10019. For additional sources of information on the articles and products in this issue, write to Bureau of Information, Popular Mechanics, for free "Where-to-Find-It" list.

DANIEL J. COLEMAN

Director of Advertising

ADVERTISING OFFICES: New York: 224 West 57th St., 765-6850; Chicago: 520 N. Michigan Ave., 527-2400; Detroit: General Motors Bldg., TRinity 5-8711; Cleveland: 20310 Chagrin Blvd., Shaker Heights, 283-7788; Los Angeles: 601 North Vermont Ave., 666-6263.

JOHN A. REGINA.....Advertising Production Manager

SUBSCRIPTION SERVICE: Mail all subscription orders, changes of address, correspondence concerning subscriptions, and Postmaster notices of undeliverable copies to Popular Mechanics, Box 646, New York, N.Y. 10019. Please enclose your latest address label for quickest service when writing about your subscription.

POPULAR MECHANICS IS PUBLISHED MONTHLY by The Hearst Corporation, 57th St., at 8th Ave., New York, N.Y. 10019, U.S.A. Richard E. Berlin, President; Richard E. Deems, President of Magazines; John R. Miller, Executive V-Pres. of Magazines; Raymond J. Petersen, Senior V-Pres. of Magazines; William S. Campbell, V-Pres. of Magazines; Albert A. Rachol, V-Pres. and Director of Circulation; Joseph F. Kern, V-Pres. for Popular Mechanics; Frank Massi, Executive V-Pres. and Treasurer; Harvey L. Lipton, Secy. Single copy in the United States and Canada, 50 cents. Subscription prices: United States and Possessions \$5.00 for one year; \$9.00 for two years; \$12.00 for three years. Canada, add \$2.00 for each year. All other countries, add \$4.00 for each year. When changing address, give old address as well as the new, with postal-zone number, if any, and allow six weeks for change to become effective. Second-class postage paid at New York, N.Y., and at additional mailing offices. Authorized as second-class mail by the Post Office Department, Ottawa, and for payment of postage in cash. Registered as second-class matter at the Post Office at Mexico D.F., Mexico, June 20, 1950. © 1972 by The Hearst Corporation. All rights reserved. Printed in U.S.A.

AUGUST 1972

Build yourself a better drink.



WINDSOR CANADIAN

Canada's smoothest whisky

CANADIAN WHISKY—A BLEND • 80 PROOF • IMPORTED BY NATIONAL DISTILLERS PRODS. CO., N. Y.

LIQUID WRENCH



Liquid Wrench is the super-penetrating rust-solvent that loosens rusted nuts, bolts, screws and parts—in seconds! Safe on all metals, use it on a bulldozer or even your watch!



Lan-Lin gets down deep—removes paint, grease, grime, ink!



Trans-Medic stops transmission troubles! You'll feel the difference!

RADIATOR SPECIALTY CO., CHARLOTTE, N. C. 28201

Look for

GUNK®

when you want to clean anything!

...Like engines, power mowers, concrete driveways, parts.

There's a

GUNK

product for almost any degreasing job in factory, shop or home.



Engine Brite
Engine Cleaner.
Spray it on...
hose it off!
"Dirt and grease
wash away!"



B.O.P. Small
Parts Cleaner
with dip basket
soaks parts
clean



GP cleans
oil, grease,
dirt from
garage floors,
driveways,
power
mowers,
machinery.

GUNK LABORATORIES, 5829 W. 56, CHICAGO, ILL. 60638

Gunk Chicago Co.
River Forest, Ill.

Radiator Specialty Co.
Charlotte, N. C.

LETTERS TO THE EDITOR

Recycle, don't squeeze

In *Handy new compactors put the squeeze on trash* (page 118, June PM), you mentioned all the pertinent data relating to those gadgets—but not that the residential household has the alternative of *recycling* nearly all of the trash it produces. Bottles, cans and newspapers—the most common types of waste produced—are easily recycled at centers which have been opening up all over the country. A compactor becomes less necessary when trash is recycled, as the total trash output of a family is reduced to a fraction of what it was before.

Putting a lot of trash in a little package does nothing toward re-using any of it.
CASS LAKE, MINN. JOEL A. WARD

Torino's disc brakes

I would appreciate it if you would clarify the use of front-wheel disc brakes as reported in the *Ford Torino Owners Report* (page 92, June PM).

All 1972 Torino models are equipped with front-wheel disc brakes. Power assist is standard on the Gran Torino Squire model, a mandatory option at extra cost on Torino and Gran Torino station-wagon models equipped with airconditioning or any optional engine and on models equipped with the 429-c.i.d. 4V engine or with trailer towing packages, or is optionally available on all other Torinos.

What the story failed to make clear was the distinction between *manual* disc brakes and *power* discs.

FORD MOTOR CO. MICHAEL W. R. DAVIS
DEARBORN, MICH. TECHNICAL & PRODUCT
INFORMATION MANAGER

That Vietnam goof

As an infantryman who served with the 101st, I would like to thank you for bringing to the American public an honest account of how wastefully their tax dollars are spent (*Our great Vietnam goof*, page 70, June PM).

I have personal experience with the M-16/M-79 over-and-under, and I cannot remember anything good about it. Our

(Please turn to page 8)

POPULAR MECHANICS

Have you seen this coupon before?

© 1972 LaSalle Extension University. A Correspondence Institution

It has helped
to start
many men
and women
on the road to
higher pay.

Just looking
at it won't
get you
anything...
but putting it
in the mail
may change
your whole
future!

The LaSalle coupon is one of the most often-seen coupons in America. To many who have mailed it, it has proved a first step to opportunity and good fortune.

Cut Along Dotted Line — Seal (Tape, Paste or Staple) and Mail Today.

MAIL THIS HANDY POSTAGE-PAID COUPON-ENVELOPE

Cut coupon along dotted lines, fill in your name and address . . . fold, seal (tape, paste or staple) and mail. No stamp or envelope is necessary.

Please send me, without obligation, FREE booklet on the field I have checked:

ACCOUNTING*

- ☐ Complete Accounting
- ☐ Income Tax
- ☐ CPA Training
- ☐ Bookkeeping

BUSINESS MANAGEMENT*

- ☐ Management Training

REAL ESTATE*

- ☐ Complete Real Estate
- ☐ Real Estate Brokerage

TRAFFIC & TRANSPORTATION*

- ☐ Complete Training

STENOGRAPHY

- ☐ Machine Shorthand

***APPROVED FOR VETERANS TRAINING**

LANGUAGE INSTRUCTION

- ☐ French ☐ Spanish

MUSIC INSTRUCTION

- ☐ Piano ☐ Guitar
- ☐ Other

COMPUTER PROGRAMMING*

- ☐ Complete Training

DRAFTING*

- ☐ Complete Training

DIESEL MECHANICS*

- ☐ Basic Training

AIR CONDITIONING & REFRIGERATION*

- ☐ Basic Training

INTERIOR DECORATING*

- ☐ Complete Training

DENTAL OFFICE ASSISTANT*

- ☐ Complete Training

ART TRAINING

- ☐ Complete Training*
- ☐ Commercial Art
- ☐ Oil, Water Color

LAW COURSES

- ☐ Bachelor of Laws Degree*
- ☐ Business Law
- ☐ Insurance Law*
- ☐ Claim Adjusting Law*
- ☐ Law for Police Officers*

No state accepts any law home study course, including LaSalle's, as sufficient education to qualify for admission to practice law.

MOTEL/HOTEL MANAGEMENT*

- ☐ Motel Management
- ☐ Hotel Management

RESTAURANT MANAGEMENT*

- ☐ Management Training

WRITING

- ☐ Fiction
- ☐ Non-Fiction

HIGH SCHOOL*

- ☐ High School Diploma

Dept. 80-082

Print Name

Age

Address Apt. No.

City & State Zip

460 FOLD HERE (DO NOT CUT) SEAL AND MAIL TODAY — NO STAMP NEEDED.

FIRST CLASS
PERMIT NO. 27
CHICAGO, ILL.

BUSINESS REPLY MAIL

No postage stamp required if mailed in the United States

Postage will be paid by

LA SALLE EXTENSION UNIVERSITY

A Correspondence Institution

417 S. DEARBORN STREET

CHICAGO, ILLINOIS 60605

If your goals are bigger pay and more frequent promotion, you owe it to yourself to find out without delay, what LaSalle home study can do for you.

LaSalle gives you modern, comprehensive instruction in many well-paid, fast-growing fields where there is a continuing demand for trained personnel. You learn at home; lessons come to you by mail. You are a class of one.

For more than sixty years, LaSalle has been a leader in home study. It has a large staff of experi-

enced instructors. The cost of training is low. A LaSalle diploma is a respected credential.

You should act now. LaSalle training may make a big difference in your future. One student reports: "I received a \$2,000 yearly increase since enrollment with LaSalle. My regret is that I didn't enroll before." Many letters like this come to LaSalle. Get full information now on the field that interests you. Mail postpaid coupon above to LaSalle, 417 S. Dearborn St., Chicago, Illinois 60605.



ARMSTRONG RHINO TUFF TIRES

LETTERS

(Continued from page 6)

platoon went through several of them the year I was there. They just fell apart.

I was also a PRC-25 operator and was forced at one point to carry two extra handsets sealed in plastic bags. And the Lord only knows how many I had to exchange.

CLINTON, MISS.

GLYNN KEGLEY

After seeing all the blunders the brass made in Nam, it is really nice to have someone speak out in the Grunts' behalf. I handled various types of small arms and found many of your observations to be true. I really liked the "60," though, and never had much trouble with it.

Most of the "lifers" weren't in the field that much, and those who did get out in the bush seemed like they were still trying to fight World War II.

ANCHORAGE, ALASKA

ARTHUR GOLDBERG

Col. David Hackworth has the right answer to the cost-effectiveness, plastic-goods quartermaster corps, as well as the "let's get out now" mania. Too much junk is being sent over there.

Why doesn't the Army furnish its troops with the Sherman, Browning, M-1 and mortar used in years past? The BAR—you need a Browning to win a war.

ENSENADA, MEXICO

GEORGE MORALES

The colonel was wrong in using the Sherman as an example. I believe he will remember that on equal grounds the Sherman was outclassed by every country's tanks in World War II. After talking to many vets, I find the majority very satisfied with the M-16 and M-60.

Maybe we are looking for reasons for failure in Vietnam rather than the truth. We fought a mistake and are still fighting it.

LAKEWOOD, COLO.

ROLAND RAMADAN

Your story by a retired Army officer named Hackworth proves at least two things: The Army has its fair share of soreheads and poor losers just as does every other calling and, secondly, that *PM* should limit the content of the magazine to subjects it knows something about and stay out of military tactics and political issues.

The current fad of putting down the

POPULAR MECHANICS

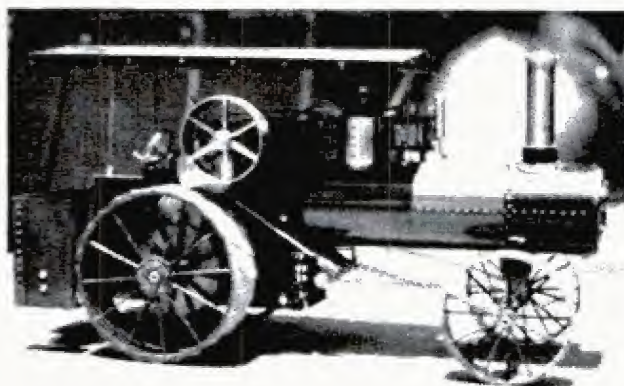
military services has produced an extremely predictable type of individual, such as Hackworth, who is willing to make "newsworthy" statements castigating those services.

Those in the services are the first to admit there are many things that need correction and improvement, and there are some individuals in the services who would be better suited for a livelihood elsewhere. However, all officers cannot be blithely put in the category of being uncouth clods hungry to get their "ticket punched," as does Hackworth. Hackworth should be an expert on "ticket punching" and "brownie points" from the number of decorations he claims.

VIRGINIA BEACH, VA. L. W. CASSELL
COLONEL, USA (RET.)

Engine builder

I just finished building the *Model steam tractor* (page 94, Feb. '71 PM). I've also built the *Model walking-beam engine* (page 156, Aug. '69 PM).



Both have been run with air, but not steam. (I'm reluctant to build a fire in the tractor and scorch the paint.)

LONGVIEW, TEX. CHARLES K. REYNOLDS

The ol' Cannonball

The author of *Your car goes with you on this train* (page 110, June PM) seemed pleased with the service the Auto-Train gave him. My family and I were not.

On Dec. 29, 1971, we took the Auto-Train from Sanford, Fla., to Lorton, Va. We drove to the "terminal" (which at that time was a tent) early. We were supposed to leave Sanford at 8:00; we left at 9:00. We were doing fine for an hour when we had to stop because a train ahead of us had fallen off the track. We were delayed an hour. The dinner was fair.

(Please turn to page 10)



Tires that skid cause more accidents than blowouts. That's why you need Armstrong Rhino Tuff Tires—specially built to grip the road for your family's protection. For the newest in safe, dependable tires—from glass belts to steel belts, from bias ply to radials—see your Armstrong Dealer today.

ARMSTRONG TIRES

LETTERS

(Continued from page 9)

The rest of the night we had to stop in every state to change conductors. They did not have a movie that night because the machine was out of order.

The next morning we found they forgot to load breakfast on the train. They stopped and bought packaged Danish. We were going along for about two hours when we hit a car. The train engine was demolished so we had to wait two and a half hours for a new one to arrive.

There were a few other problems. The airconditioning unit in one car caught fire. The chemicals from the toilets came up from all the bouncing the train did.

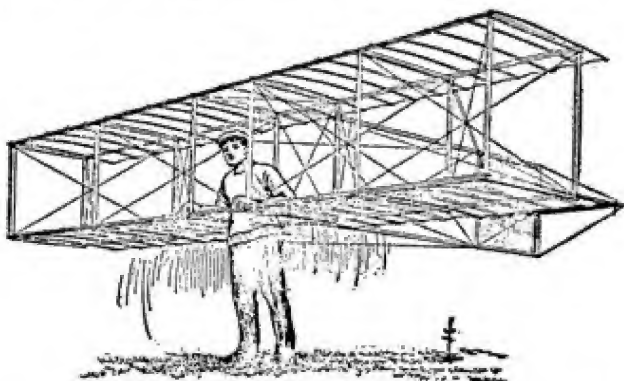
The author mentioned the "food was superior to the airline variety." It's supplied by the same company that supplies most of the airlines.

FREEPORT, N.Y.

GLENN POLLY

Air surfing—nostalgic revival

The article *Air surfing: a nervy new sport* (page 98, June PM) credits "hang gliders" and air surfing with being a new sport. Perhaps more properly it might be



regarded as a nostalgic revival. Here's a drawing included with the plan for a hang glider published by PM in *The Boy Mechanic* in 1913.

CARTERVILLE, ILL.

HERBERT R. BOLLAND

Let's keep history straight and give credit where it is due. Otto Lilienthal, familiar to students of aviation history as the probable inventor of hang gliding, made hundreds of flights and went to his death in one of them in 1896!

RANDLEMAN, N.C.

ROBERT G. VAUGHN

Illuminated magnifier

The Illuminated Stand Magnifier shown at the top of the first page of *Exciting*

New Products (page 130, June PM) is all you say it is—but the price is wrong. It sells for \$9.95 postpaid.

NEW YORK

M. FROMMER

Sorry about our error. The correct price is \$9.95 from Better Vision Co., 23-26 143rd St., Whitestone, N.Y. 11357.

How the kid climbs aboard

All four of my children are demanding bunk bed/desks like the one in *This kid studies under his bed* (page 156, June PM). One question: Where did those metal handhold-steps come from?

MADISON, WIS.

RONALD E. WYLLYS

They're boarding steps (generally used on boats) and are available from almost any fair-sized marine-supply shop. Those shown are bronze, which can be special-ordered if the dealer has only chrome.

Great Workshops

I really look forward to each article in your Great Workshops series. Most editors of mechanical magazines seem concerned mainly with the "end product" and have forgotten the man who likes working with his hands for the enjoyment of it and just being in the shop for the joy of being there. You are doing a fine job.

LONG BEACH, CALIF.

E. LEONE SHURTE

It's fascinating the individual approach these people take in laying out and using their shops.

PORTLAND, ORE.

WILLIAM F. ROONEY

I would like to tell you how much I enjoy the workshops featured in PM. I happened to purchase your June 1970 issue at a newsstand and saw the workshop of the Minneapolis lawyer featured under the title *Is this the best workshop in the world?* I finally got around to subscribing to your magazine and came across the fourth in the series (*This shop paid for itself . . . and grew and grew*, page 63, June PM). I somehow missed the second and third; can you supply dates of the issues?

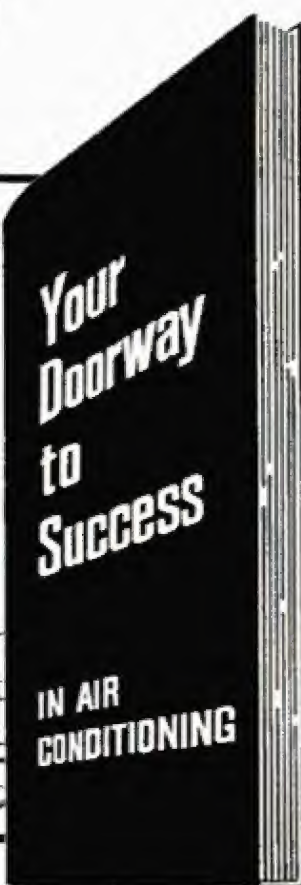
OCEANSIDE, CALIF. ROBERT F. ANDREWS, MD

The four Great Shops appeared in June '70; June '71; January '72 and June '72. The fifth will be in October—and we plan to have more after that.

★★★

**Is a low-pay
job holding you
down?**

**Move up as a high
salary specialist
in air conditioning**



Send for this Free Book!

**WE TRAIN YOU AT HOME A NEW, EASY WAY
AT 1/3 TO 1/2 THE COST OF MOST PROGRAMS!**

There's a great, new job in your future, and it's closer than you think! Just send for our informative free book, *Your Doorway to Success in Air Conditioning*, and find out how to move up to a high-salaried job in air conditioning! With man size benefits: action, variety, challenge, security, prestige — everything you've always dreamed of in a career with a wide-open future!

**Train at home for the lowest
cost of any similar course!**

Liberty School prepares you at home while you hold your present job. You learn everything you need to know to install, service and maintain all kinds of air conditioning, refrigeration and heating equipment. In easy, down-to-earth lessons, you learn from scratch—even if you never finished high school.

The new Liberty method trains you fast with no costly frills, no equipment to buy, no high-powered salesmen to call on you. You get the best professional training developed by a leading educator—yours for a fraction of the fees most other schools ask!

Earn extra money while you learn

By the time you finish the course, you may be doing spare-time repair jobs for your friends and neighbors—earning real money with your new skills. Then there's

nothing stopping you from making the big switch to a full-time prestige career as an air conditioning specialist. Or go into business for yourself! Operate your own service shop and pocket all the profits!

The air conditioning industry needs thousands of service men this year, and you could be right in line if you are professionally trained the easy, new Liberty way.

Wasting time costs you money! Send for the facts about your golden future in air conditioning today! The facts are free!

Liberty School, Libertyville, Illinois 60048

Free Book—No Obligation

LIBERTY SCHOOL
Technical Division, Dept. J-8
1111 West Park Ave., Libertyville, Illinois 60048

☐ Okay! Rush me the free book, *Your Doorway to Success in Air Conditioning*, and full details about your professional training. No salesman will call.

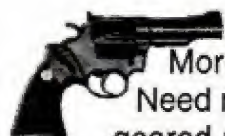
Name _____ Age _____

Address _____

City _____ State _____ Zip _____



"The Colt's cares" package"



It means more service.

More convenience.

Need repairs or parts? We're geared up now to handle them faster than ever, both at Hartford and through parts distributors and warranty repair stations throughout the country.

Have questions about some Colt's product? We've got a brand new department ready for the answers. (Feel free to write Colt's Customer Service Department.)

Looking for some specific Colt's firearm? Could be that one of our many new dealerships has it in stock. (You'll be interested in knowing, too, that we've put on a lot more skilled workers at our plant in order to increase production of some of those products you've been looking for.)

You bet "Colt's cares".

Cares about the safety of its products.
Cares about the quality of its products.
Because Colt's cares how you feel about our products.

Colt Industries  **Firearms Division**
Hartford, Conn., U.S.A. 06102

PUBLICATIONS **WORTH WRITING FOR**

GARDENERS will find a wealth of information in *PM's new Complete Gardening Guide*, a set of 12 plastic-laminated hang-up boards containing basic gardening information ranging from "Basic landscaping" to "House plants." The 8½ by 11-inch boards come in an attractive spiral binding. Other subjects in the guide include: "Man-made parts of your landscape," "Garden surfaces," "Gardening in your climate," "How to improve your soil," "Starting seeds," "All kinds of transplanting," "Trees," "Shrubs," "Pruning," "Flowers," "Establishing a lawn," "Vegetables," "House plants," "Storage structures." To order your *Complete Gardening Guide*, send \$3.95 with your name and address to Popular Mechanics, Dept. GG, Box 1014, Radio City, N.Y. 10019.

THE HANDIEST 'TOOL' in your shop will be *PM's Master Shop Guide*, a set of 12 hang-up boards packed full of charts and information on basic shop techniques and materials. The wipe-clean, plastic-laminated boards will last for years, even under constant use you're sure to give them. Subjects include: What nails, screws, bolts, wall-fasteners, drills, abrasives to use and why; how to order and use lumber, hardwoods, moldings and plywood. Send \$3.95 with name and address to Popular Mechanics, Dept. SG, Box 1014, Radio City, N.Y. 10019. ★★

POPULAR MECHANICS

YOU GET ALL THIS with new NRI Master Automotive Technician home training. Included is the NRI Achievement Kit we send you the day you enroll . . . ten outstanding kits of automotive testing and repair equipment, plus educator-acclaimed NRI "bite-sized" texts — all yours to keep and use for years to come.



NRI announces a dramatic new way to learn Automotive Repair at home

Top auto experts praise NRI's new training plans

After more than two years of preparation, NRI has made available two new home training programs in Automotive



Servicing and Repair, acclaimed by experts as "amazingly complete" and "up with the times." NRI asked two of America's foremost automotive experts to critique its new program. William H. G. France, president of NASCAR and the International Speedway Corp., reported,

"The new NRI courses for mechanics are amazingly complete and seem to cover all major aspects of today's sophisticated cars. If you're at all interested in automotive training, I suggest you investigate NRI." Car-tester/writer Tom McCahill was equally enthusiastic. "I've been around cars since bathtub gin, and I've never seen home training for mechanics as great as this."



Professional equipment included at no extra cost

NRI gives you the choice of Master Automotive Technician training or a shorter Automotive Tune-Up and Electrical Systems course for the man seeking greater understanding of basic car repair. The Master course covers every major aspect of auto repair, from changing spark plugs to operating your own garage or car-care center. You not only learn the how and why with NRI's proved-in-use "bite-sized" texts, but you also get professional training equipment you need to actually do the work on your own or other cars as you move along in your home training. Equipment you get — at no extra cost — includes your own ignition-analyzer scope, as well as a dwell-tachometer, timing light, complete set of tools,

volt-amp tester and assorted gauges. You get ten kits in the Master Automotive Technician course, eight with the shorter Automotive Tune-Up and Electrical Systems Training program.

The professional tools and equipment you get from NRI are yours to keep and use in the years to come, as you build a top-pay career as a Master Mechanic, or earn \$5 to \$7 an hour in spare time, or simply save money by repairing your own cars at home.

Train with the leader

The same pioneering home training methods and innovations which have made NRI the leader in other career training fields are now offered to ambitious men who want to turn their interest in cars into a solid, well-paying career. Take a tip from Tom McCahill and Bill France and train at home with the leader. Rush coupon now for free NRI Automotive Catalog. NRI AUTOMOTIVE DIVISION, Washington, D.C. 20016. No salesman will call.

In Canada write: NRI Canada, 330 Progress Ave., Scarborough, Ont.



**Rush coupon
for FREE catalog**

AUTOMOTIVE DIVISION
3939 Wisconsin Avenue, N.W.,
Washington, D.C. 20016



946-082

Please send me your new Automotive Catalog. I understand there is no obligation. No salesman will call.

I am interested in ☐ Master Course ☐ Tune-Up Course.

Name _____ Age _____

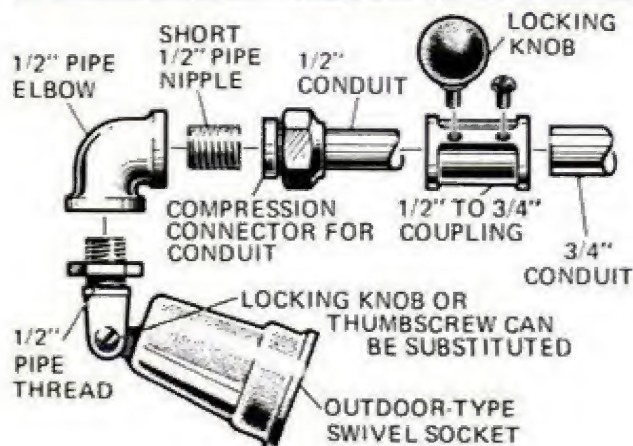
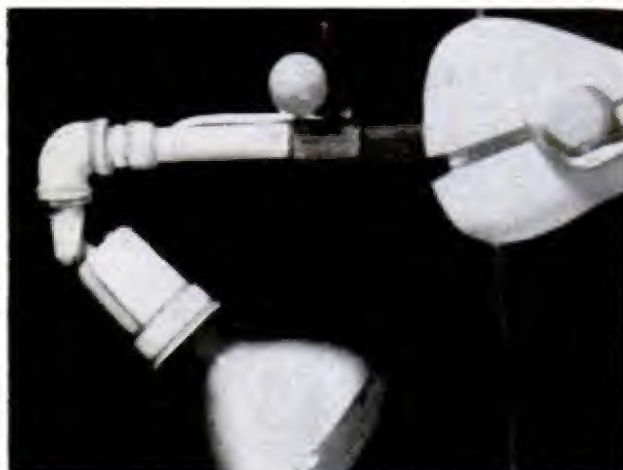
Address _____

City _____ State _____ Zip _____

ACCREDITED MEMBER NATIONAL HOME STUDY COUNCIL



REFLECTOR-FLOOD MOUNTING is similar for both swinging boom and telescoping upright. But the $\frac{3}{4}$ -inch conduit and the $\frac{1}{2}$ to $\frac{3}{4}$ -inch coupling shown apply to the upright only; the $\frac{1}{2}$ -inch conduit telescopes inside the larger tube for height adjustment

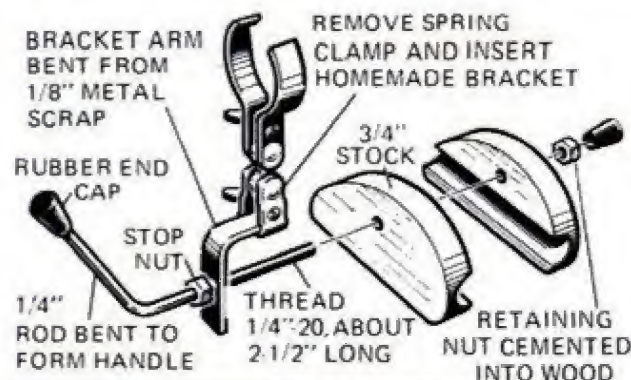


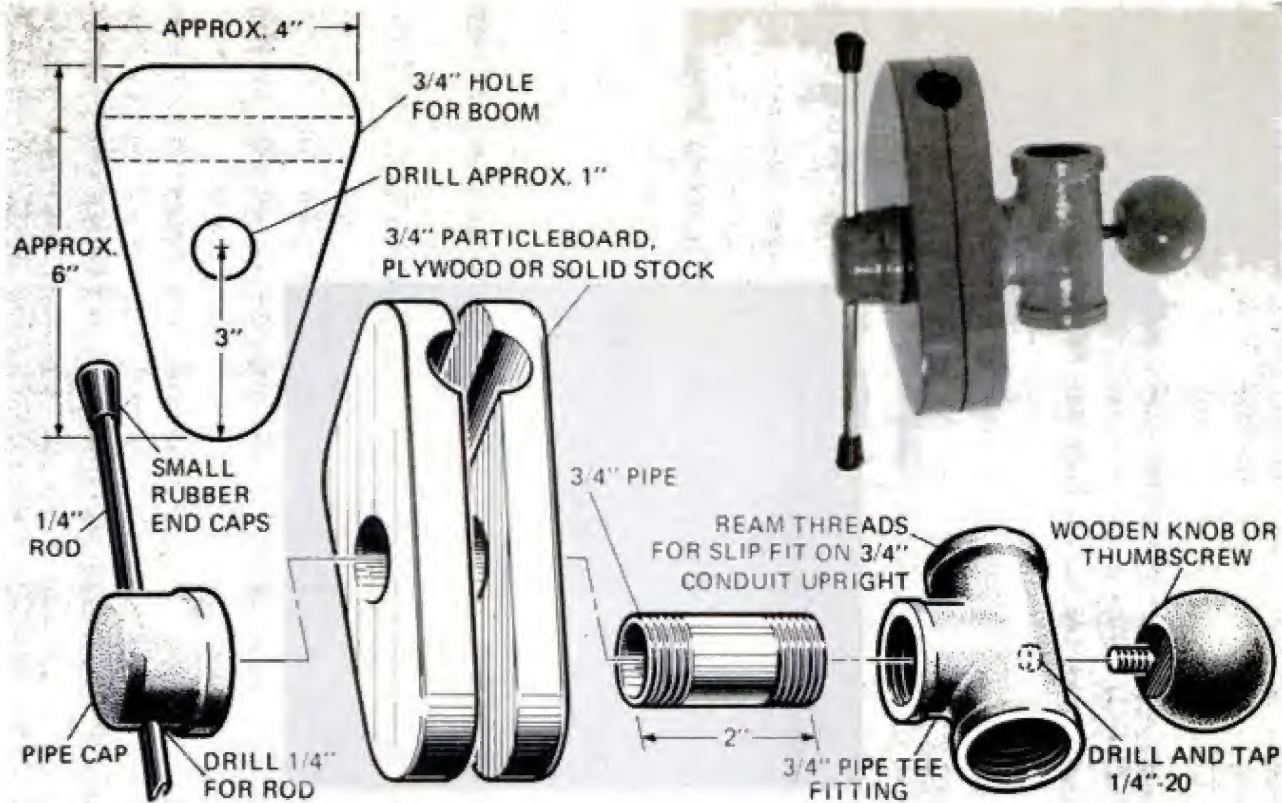
Build a rolling dolly for your photo lights

By ROSS SCOTT

IF HAULING LIGHT STANDS out of your closet discourages you from using your floodlights, this octopus-like, rolling stand should encourage you again. It's flexible to handle all the lighting you need for small-object or tabletop photography; for portraits and other, larger subjects, you may want to build more—or modify the dolly base to hold extra stands when you need them.

The basic design is easy to adapt to your needs—build as many booms as you need, modify the upright to hold your projection screen (with your projectors stored on the dolly base), or even use it as a rolling microphone boom. As shown here, the unit holds both reflector-flood bulbs and regular flood bulbs in standard reflectors. You can adjust the lighting patterns of the latter type by changing reflectors or adding "barn doors." ★★★





CLAMPING BOOMS to the upright post takes this heavy-duty assembly. To drill hole for the boom, cut the clamp sides from wood or particleboard, clamp them around 1/8-inch hardboard filler and drill a 3/4-inch hole through all three pieces. Remove the fill-

er and you'll have enough clearance for proper clamping action. Smaller clamp (facing page) is drilled similarly. Socket and holder shown with latter come from standard, spring-clamp floodlight assembly; just remove the spring and substitute bracket



Car and Camera.

Behind the wheel or the viewfinder, speed counts.

When Mario Andretti shifts gears, he doesn't have time to take his eyes off the road. With a Minolta SR-T 101 you don't have to look away either.

To adjust exposure, simply align two indicators in the viewfinder. A scale shows the exact shutter speed, so you never lose sight of your subject.

As the official camera of the Vel's-Parnelli Jones Racing Team, we're running the biggest automobile photography contest ever — The

Minolta Car and Camera Competition. Grand prizes: 2 Alfa Romeo 2000 Spider Veloces, each with an SR-T 101. Other prizes: \$9,000 worth of Minolta equipment. All prizes will be awarded.

For details, see your photo dealer or send a postcard specifying your name, age, address and present camera brand to The Minolta Car and Camera Competition, P.O. Box 229, Cooper Station, New York, N.Y. 10003.

Minolta

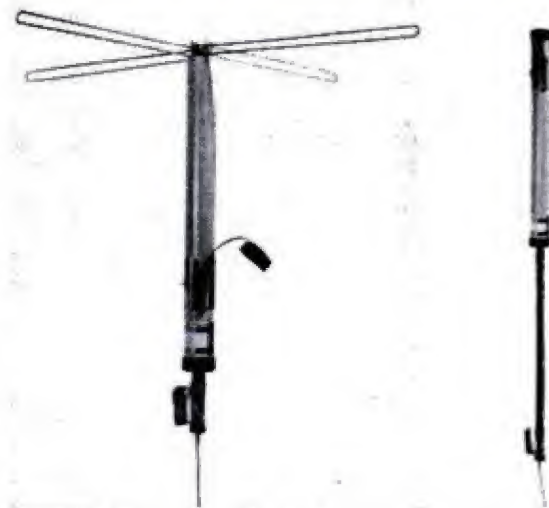
Enter our Car and Camera Competition.

When identified by a factory-sealed "M" tag, Minolta 35mm reflex cameras are warranted by Minolta Corporation against defects in workmanship and materials for two years from date of purchase, excluding user-inflicted damage. The camera will be serviced at no charge provided it is returned within the warranty period, postpaid, securely packaged and including \$2.00 for mailing, handling and insurance.

NEW FOR YOUR CAR



TWO NEW TV ANTENNAS are designed especially for mobile use. One above, made by Sony, has rooftop mount to fit car or camper, sells for about \$25. It features a quick-disconnect arrangement that lets you detach the antenna without removing the roof mount. Telescoping antenna at right attaches to the side of a motor home, camper van or similar RV. When not in use, its arms fold neatly out of way (far right). \$35.80, Antenna Corp. of America, Box 865, Burlington, Iowa 52601.



KIT-BUILT BATTERY CHARGER works automatically—you just plug it into house current, clip it to the battery terminals and forget it. It brings the battery up to proper voltage, then shuts itself down, maintaining just enough trickle current to compensate for normal leakage. Designed for 12-volt auto-type batteries, it has a 10-amp. capacity, assembles in few hours. GP-21 kit is \$29.95. Heath Co., Benton Harbor, Mich. 49022.



“Fish Story”



How good it is

with **Winston's finer flavor**

Ask any Winston man why he smokes Winston
and he'll tell you... *how good it is!*
Yes, Winston tastes good like a cigarette should.



Warning: The Surgeon General Has Determined That
Cigarette Smoking Is Dangerous to Your Health.

© 1972 R. J. REYNOLDS TOBACCO COMPANY, WINSTON SALEM, N. C.

20 mg. "tar", 1.3 mg. nicotine av. per cigarette, FTC Report APR. '72.

AUGUST 1972

ALL By BILL McKEOWN OUTDOORS

THE GROWTH OF HIKING as a sport is hard to measure, and so are all the reasons for the boom. A market study by Wenzel Tent Co., one of the long-established manufacturers who recently entered the field with a new line of backpacking gear, estimates that in 1970 the wholesale level of sales was \$20 million. Then, in 1971, that total more than doubled to \$50 million worth of backpacking equipment.

Today's packer can buy frame, pack and duffel of reasonably good quality for \$40, and a sleeping bag with synthetic substitute for down for the same amount, Wenzel notes. This summer I've seen many backpack campers who must have fitted out for under \$15 at surplus stores. But there is also a trend toward top-grade gear, and the brand names carried across the hills are old familiars plus new ones mixed in that you might not expect: Gerry, Camp Trails, Kelty, Sears, Holubar, Coleman, Bean, Thermos, Himalayan, Eddie Bauer, Trailmaster and others. New lightweight freeze-dried and compact foods are usually considerably more expensive than the originals. But for the dedicated backwoodsman, who will cut half the handle off his toothbrush to save weight and knows that every added ounce feels like a pound on his back late in the day, the freeze-dried edibles can mean extra days in the woods for him.

WHY SO MANY CAMPERS want to get away from crowds is easy to explain, but where they want to go instead and how they prefer to travel has not yet been documented. There is no charge for back-country camping by backpackers in the national parks, although many parks require fire permits. To learn if more areas should be set aside for back-country camping, however, an experimental free permit system is being tested this season at Great Smoky Mountains National Park on the North Carolina-Tennessee border, the Rocky Mountain National Park in Colorado and California's Sequoia-Kings Canyon National Parks. Permits are issued on a first-come, first-served basis.

The National Park System now has 28,000 campsites at 524 campgrounds in 86 areas, and its popular 30-cent guide, *Camping in the Na-*

tional Park System, includes the Amistad Recreation area in Texas, the Fort Larned National Historical Site of Kansas, and the Katmai National Monument, Alaska, for the first time. The camping guide can be ordered from the Superintendent of Documents, U.S. Government Printing Office, Washington D.C. 20402, and, like other government publications, the price is so low that an outdoorsman may feel like he's getting a tax refund—which, in a way, he is.

MANY RVS CARRY EXTRA BATTERIES, the Recreational Vehicle Institute points out, and servicing them, switching them around, taking them out for a charge or relocating them in unsuitable compartments can be potentially dangerous. A fully charged battery generates explosive hydrogen gas, and erupting battery acid can also injure the face and eyes. Mike Radigan, national director of the RVI, notes that a recent National Safety Council survey pointed to the following as possible causes of accidents:

- Installing a fully charged battery while some switches are on.
- Installing a battery with cables crossed.
- Fastening cables to battery post which is broken inside the battery.
- Filling a warm battery with water when a spark is present.
- Using a match for light when checking fluid level.
- Connecting battery to a charger that is already turned on, or removing battery before switching off charger.

Battery servicing by a responsible and experienced garage mechanic—or at least some instruction from one—is a good idea for RV owners who are new to camping.

A NEW HUNTER SAFETY PROGRAM that will, it is hoped, be national in scope has been announced by Don Berchtold, president of Crosman Arms, the maker of CO₂, air and spring-powered firearms. With the passage of a bill last year which grants federal aid to states for hunter safety instruction programs, local training classes in proper gun handling should now be possible. Crosman plans to work directly with authorized safety instructors to allow both indoor and outdoor shoot-

(Please turn to page 20)

Our outboard engineering know-how



helps us know how to build better stern drives.

OMC Stern Drives are made by the same people who make more outboards than anyone else. And that pays off when we build stern drives. For instance, the OMC Stern Drive 75° power tilt that lets you beach, trailer and launch more easily. The full 90° port to starboard turning that gives you up to 50% more maneuverability than others. And resistance to salt water corrosion that is unmatched by competition.

Our engineering shows everywhere you look. It shows in a power shift that eliminates jerks and hesitations. And a quiet-mounted engine that lets you knife through the water virtually vibration-free. And in automatic kick-up of the outdrive that protects you from sunken hazards.

When you specify OMC Stern Drive on your next boat, you have a lot more going for you. Outboard Marine Corporation engineering for one thing.



OMC 
Stern Drive
A DIVISION OF OUTBOARD MARINE CORPORATION
3145 CENTRAL AVENUE, WAUKEGAN, ILLINOIS 60085

IT'S WHAT YOU'D EXPECT FROM THE MAKERS OF JOHNSON & EVINRUDE.

ALL OUTDOORS

(Continued from page 18)

ing and gun-handling instruction in areas where extensive outdoor rifle and shotgun ranges are not available.

"Our recreational guns," Berchtold states, "are constructed in the same manner, and have the same weight and feel of rimfire rifles, pistols and shotguns. We believe they are ideally suited for hunter safety work." Crosman will make available both their guns and pellets or BBs practically at cost. In the past, instructors have sometimes had to pay for supplies out of their own pockets, and practice firing has been very limited. With Crosman guns, backstops of boxed newspapers or magazines are claimed to be suf-



ficient for indoor range safety and excellent short-range accuracy is reported.

Free service and repairs for any guns purchased for the classes are also being offered. Some states already require that hunters pass an approved safety course before being allowed to obtain a license. Details of the Crosman Hunter Safety Program may be obtained from Terry Lynch, Crosman Arms Co., Fairport, N.Y. 14450.

THE CARELESS BOATMAN can now be stopped right where he is by Coast Guard boarding officers and corrective action taken. And if the hazard cannot be cured on the spot on the water, the boat can be ordered back to shore. Under the authority of the new Federal Boat Safety Act passed last year, pleasure craft on federal waterways are in trouble if they lack sufficient life-saving or firefighting devices, are overloaded, display improper navigation lights at night, have a leakage and/or accumulation of fuel, lack required flame-arresting devices on inboards, or do not have adequate tank and engine space ventilation.



SMALL CHANGES can make a big improvement in items of outdoor equipment we found while testing several new products. A travel bag from L.L. Bean, the fine old outfitter in Freeport, Me., offers a choice of hand grips or shoulder straps for toting it when your hands are already full. Bean's travel bag is leather-reinforced at wear points, costs \$24.50 post-paid. Sears' Jetwind looked like a number of other sailing surfboard modifications until we tested her in a gusty breeze. Then we found she could accelerate with a real push, and though stiff enough with two aboard, might flip in a hurry for a careless single-hander helmsman. Olympic skipper George O'Day helped develop her. A real performer for under \$500. And Normark's fine \$6 Swede 45 looks like a lot of other pocket camp knives—with two exceptions. These are screws in the handle that make it quick and simple to dismantle and clean when switching from fish scaling to slicing food. A Rapala product



Dangerous and reckless operation includes obvious overpowering as well as carrying too many passengers, and it's obvious the Coast Guard isn't kidding around about boat safety. Neither are the states, and a number are passing laws so that waterways that do not come under federal jurisdiction will have the same requirements as those that do.

NATIONAL HUNTING & FISHING DAY, Sept. 23, 1972, has received official recognition from President Nixon. ★ ★ ★

POPULAR MECHANICS

For a guaranteed choice of jobs call 800-631-1972 toll free.*



Now you can get information on Air Force opportunities by calling this number anywhere in the country — toll free. And it can be a real hot line as far as your future is concerned.

For instance, any job you're trained for, any skill you learn in the Air Force will be valuable to you in or out of the service. Air Force skills are lifetime skills. Right now, your Air Force Recruiter has a special listing of select jobs that he can guarantee to you before you join up. No more chance, just choice.

Give the Air Force a call. It could be the most important call you ever made.
(*In New Jersey call 800-962-2803.)

Find yourself in the Air Force.

DETROIT

LISTENING POST

BY ROBERT LUND

THE 'WONDERFUL' WANKEL looks more and more like a short-term bridge-the-gapper between the conventional piston engine and the turbine. The evidence is subtle. When GM gets into a new product program, suppliers scramble for a place in line for a piece of the action. In the case of the Wankel, suppliers who were pitching to produce parts for the engine a few months ago now take the position that if they can't get in and out with a profit in three to four years, they might as well forget it. That doesn't sound like the Wankel's going to be a volume engine for too many years.

Another vote for the turbine: Chrysler says the new turbine it's working on will be the pilot job for a production version. That's not the same as saying the turbine's ready to roll. But it's just one step removed from production.

FILL 'ER UP. Turbine, Wankel, stratified charge or a scrubbed-up version of the present piston engine—you might as well resign yourself to the idea that any car you buy over the next five years is going to be a gas guzzler. You'll have to fill the tank more often. The best results anybody's been able to wring out of the new engine so far burned 10 percent more fuel than a standard piston plant. That experiment was with a turbine.

Fuel consumption is so far out of line on experimental versions of the Wankel and stratified-

charge engines that engineers don't want to talk about it.

LONG-OVERDUE FILE: You wonder what takes Detroit so long to gear up for a good thing? So do we. GM, at last, hopes to have front disc brakes standard on every car in its catalog within the next few months. If they're not standard when the '73s go on sale, they'll come up as a running change next year. Next item in the file: electronic fuel injection. But that's another story.

YOU'LL SEE SOME '73 CARS on the road before you read about them in the papers and magazines if you keep your eyes open the next few weeks. This has happened before, but the door's wide open this year. Most car companies have given up asking dealers to keep the new stuff stashed away until announcement day.

It's a curious change in the rules. If a publication digs up the dope on the new cars on its own, it's entitled to print whatever it turns up. The companies don't make it easy to obtain information before they're ready to release it, but they no longer try to suppress preview stories as they used to a few years ago.

But once you accept the information above the table, visit the proving grounds and drive the cars, take the handouts (news releases) and engineering books from the

(Please turn to page 24)

CHEVY MONTE CARLO won't be the only '73 car with the little-rear-quarter-window fad: Cadillac introduced it on '71 Eldorados, and, sure enough,

as Auto Editor Bill Hartford said then, "... it grows on you and is likely to show up on pretenders in the future." (See '71 Cars, page 24, Oct. '70 PM.)



Spend a milder moment with Raleigh.

Highest quality tobaccos—specially softened for milder taste.



A Model "A" restored to mint condition. And the right tools made it easier. You can get car tools like his free for Raleigh coupons, the valuable extra found on every pack of Raleigh. See over 1000 other practical and valuable gifts. Send for your free copy of our Gift Catalog. Write Box 12, Louisville, Ky. 40201.

ONE ON B&W RALEIGH COUPON
Redeem B&W COUPONS for valuable gifts through the Brown & Williamson Premium Plan. You get another B&W COUPON on every pack of RALEIGH and BELAIR.

Warning: The Surgeon General Has Determined That Cigarette Smoking Is Dangerous to Your Health

Filter Kings, 17 mg. "tar," 1.3 mg. nicotine; Longs, 19 mg. "tar," 1.4 mg. nicotine, av. per cigarette, FTC Report April '72

© 1972 BROWN & WILLIAMSON TOBACCO CORP.

The quality performer handloaders prefer.



Winchester- Western Cartridge Cases

From Winchester-Western's own brass mill. Formulated by our own experienced metallurgists. Cartridge cases of custom-blended alloys in 41 calibers for rifles, pistols and revolvers. Start-to-finish control brings you a better-built brass cartridge that users recognize. A uniquely smooth, durable case everytime for exact chambering, flawless ejection, and maximum reloadability. Perfectly tailored and superbly engineered to Winchester-Western's total system of matched components. *WINCHESTER-~~Western~~*. 275 Winchester Avenue, New Haven, Conn. 06504

1972 | winchester
the way you
want it

DETROIT LISTENING POST

(Continued from page 22)

public relations men, the rule requires that you observe the publication date dictated by the car manufacturer. It's a contradiction to put an embargo on publications when dealers are selling the cars openly a month or more before the official release date. What's the point of the secrecy bit once the cars are on the road? Not that it matters much this year. Except for the GM intermediates, appearance changes on most of the '73s are so minimal you'll have a tough time distinguishing the difference between old and new.

GM WILL FOLLOW UP its redo of its mid-size cars this year with new metal for its big cars next year—the '74 models. Chrysler's also considering a major going-over for its full-size cars in '74, but might hold off another year. Big C's evaluating everything it has in the corporate garage with the view of adding cars and dropping cars.

UP PERISCOPE? Some sort of out-of-the-car periscope is inevitable for cars coming in '75 and after. There are several regulations, announced or pending, relating to rear vision that can only be satisfied by going to a periscope. Automakers anticipate the government will eventually require head restraints for the rear seats. There's also a standard coming that'll specify that the driver must be able to see the back corners of the car. If you put high-rise headrests in the rear, they cover up the back window. So the only way to go is to use a periscope.

BUYING TIP. If you're figuring to buy a Ford, Chrysler or American Motors car, and are willing to settle for a '72 instead of waiting for a '73, this is the time to tackle the dealer. Ford, Chrysler and AMC are cutting the downtime between model changes. This means the dealer has only a few days to clean out his '72s before the first of the '73s arrive.

Ford has reduced the changeover period to two days. Chrysler will close three to five days. American Motors will take two weeks. With big inventories of '72s to clear out, most dealers will be shaving prices to reduce the load of '72s carried over to the '73 model year. GM will take a breather of a month between model runs, giving dealers a longer time to move the '72s, so GM outlets won't be quite so eager to trim their prices.

★★★

12 ways to beat the "wage-price" squeeze!

If you've been told that you can't get a decent raise because of the government freeze on wages, then you haven't heard the whole story.

The fact is—in spite of the freeze on wages—you have always been entitled to an increase in pay—

—if you could get yourself promoted to a more responsible position where you now work...

—or if you could switch to a better-paying job with another company.

For example, here are 12 ways to beat the "wage-price" squeeze!

• If you're a veteran with some technical experience—or if you're a pretty good mechanic or repairman—all you may need to qualify for a promotion is some specialized career training in fields like (1) Engineering; (2) Drafting; or (3) Electronics. (Or you might prefer to open a business of your own, with valuable training as an (4) Electrician; (5) Auto Mechanic; or (6) TV Repairman.)

• If you're a salesman, office worker, or production foreman—or if you're just plain good at working with people—all you may need to start moving up the executive ladder is some specialized training in (7) Business or Production Management; or (8) Hotel/Motel Management. (Other alternatives, for both men and women—(9) Secretarial training...or (10) a career in Interior Decorating.)

• Or if you're already working with numbers—maybe as a Biller or Traffic Manager—all you may need is some professional training to become an (11) Accountant or (12) Computer Programmer.

In other words, if you want more out of life than you can buy today on your present salary—things like a bigger home, a better car, and greater financial security for your family—all you may need

to get it, is some specialized training in the career field of your choice. And, thanks to ICS, you can now get this training right in your own home...during your spare time...without ever setting foot in a classroom.

Just take a moment to consider the 12 career titles listed in the coupon below, then check off the field you would like to specialize in, and mail the coupon to ICS for a free Career Guidance Booklet.

Your free booklet will describe the higher earnings and greater financial security you might expect, once you have picked up the specialized training you need. It will also explain why ICS can now give you this specialized training, during your spare time, so that you will not lose a single day's pay from your present job while you prepare for your new career.

In addition, you will receive a free "Demonstration Lesson" that lets you see for yourself why preparing for a new career—the ICS way—may be a lot easier than you think.

Please bear in mind, as you check off your career choice, that over 8,500,000 men and women have turned to ICS for career training, since 1891.

ICS has also provided training programs for divisions and branches of companies like Ford, U.S. Steel, Chrysler, Mobil, DuPont, etc.

ICS career training is approved for Veterans and Servicemen under the new G.I. Bill, and is Accredited by the Accrediting Commission of the National Home Study Council.

Now it's your turn to discover how ICS training can start you in a rewarding new profession—by just mailing the coupon today for your free Career Guidance Booklet and free "Demonstration Lesson."



Free Booklet
& "Demonstration
Lesson." Mail
coupon to: ICS,
Scranton, Pa.
18515

ICS Scranton, Pennsylvania 18515

Please send me a free Career Guidance Booklet and a free "Demonstration Lesson" for the field I have checked below. I understand that I am under no obligation.

RA320W

ACCOUNTING
☐ CPA Training
☐ Business
☐ Tax Specialist

BUSINESS MANAGEMENT
☐ Administration
☐ Management
☐ Production

COMPUTER PROGRAMMING
☐ Essential Concepts
☐ Cobol; System 360;
Fortran IV

ENGINEERING
☐ Civil
☐ Mechanical
☐ Chemical
☐ Electrical
☐ Industrial

HOTEL/MOTEL MANAGEMENT
☐ Executive Training

ELECTRICIAN
☐ Master Electrician

DRAFTING
☐ Architectural
☐ Mechanical
☐ Electrical
☐ Electronic
☐ Aircraft
☐ Structural
☐ General

AUTOMOTIVE
☐ Mechanic
☐ Air Conditioning
☐ Body Rebuilding and Refinishing
☐ Diesel-Gas

ELECTRONICS

☐ Computer Servicing
☐ Communications/Broadcasting
☐ Solid State Electronics
☐ Sound Systems
☐ Telephone
☐ Industrial

☐ Technician
☐ FCC Licensing

INTERIOR DECORATING
☐ Decorating
☐ Design

SECRETARIAL
☐ Executive
☐ Medical
☐ Legal

TV SERVICE AND REPAIR

☐ Servicing and Specialized Training
☐ CATV/MATV
HIGH SCHOOL DIV.
☐ For men and women who want to earn a High School Diploma

Name _____

Address _____ Apt. No. _____

City _____ State _____ Zip _____

Approved for veterans under the new GI BILL/Approved for federally insured loans
Accredited by the Accrediting Commission of the National Home Study Council



Good for planes, not hearts

SOME HEART PATIENTS in Bremen, West Germany, complain that signals from a new radar tower interfere with the functioning of their pacemakers, electronic devices that maintain proper heart rhythm. A few pacemakers reportedly have conked out completely. The strong radar signals also cause radio listeners to hear a "bleep" every eight seconds and TV viewers to see a picture marred by a pattern of white lines. Perhaps the only people happy about the tower are air-traffic controllers and pilots.

ONCE-A-WEEK SHOWERS will be one of the homelike comforts available to astronauts aboard Skylab, the extended Earth-orbit mission scheduled for '73. A shower curtain attached to a 42-inch-diameter hoop will be pulled out of a floor mounting and hooked to the crew cabin's ceiling. The astronaut will spray himself with warm water from a hose resembling the spray attachment on a kitchen sink. Each crewman will be limited to about three quarts of water per shower. A vacuum system will draw used water from the enclosure and into a disposable bag that will be deposited in the waste tank.



It's all a matter of taste

EATING HABITS OF COWS have come under the scrutiny of investigators at an experimental farm near Seesen, West Germany. Researchers hang a "chow meter" around a cow's neck, then turn Bossie out to graze. The device is a chronometer that registers the hours and the duration of the cow's chow times as she wanders across pastures of different types of grass. The researchers are hoping to learn more about cows' taste in grass.

A LITHIUM-SULFUR BATTERY, currently in the research and development stage at the Argonne (Ill.) National Laboratory, is expected to deliver five times as much power per unit of weight as conventional lead-acid batteries. Scientists base that expectation on the results of past research on high-energy batteries. "Results of performance tests on laboratory-size cells indicate that a lithium-sulfur battery could satisfy the performance requirements of an electric automobile," says a senior researcher. The battery is expected to be available for commercial use within 6 to 10 years.



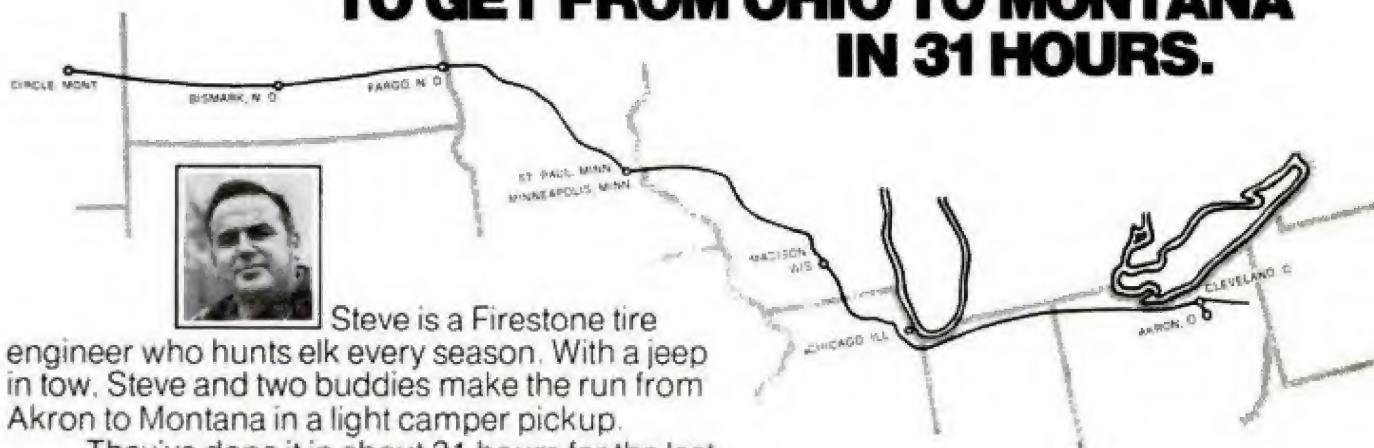
Fast tonsillectomy in Moscow

A FAST FREEZE SPEEDS UP tonsillectomies in one Moscow hospital, according to Tass, the Soviet news agency. A cryoapplicator, cooled by liquid nitrogen flowing through a Teflon tube, quickly freezes the tonsils. Then the surgeon inserts a scissorslike instrument

(Please turn to page 30)



STEVE PETRASEK HAS A SYSTEM TO GET FROM OHIO TO MONTANA IN 31 HOURS.



Steve is a Firestone tire engineer who hunts elk every season. With a jeep in tow, Steve and two buddies make the run from Akron to Montana in a light camper pickup.

They've done it in about 31 hours for the last nine years. Because they've systemized things down to the last spare bolt: Two-hour driving shifts, fuel records, and food and gear allotments figured to the final fresh egg.

The tires they'll be using next season are a natural part of this computer-like approach.

Firestone's Wide Oval Tire System for campers. Here's how it works:

On the front, you put Firestone's Transport 500 Wide Oval® truck tires. They're the *steering* part of The System. They have a wide, wide tread that grips the road to deliver more mileage under normal conditions than the tires they replaced in our line. (The Transport Wide Oval.)



On the rear, you put Firestone's Traction All Season™ Wide Oval™ truck tires. They're the *drive* part of The System. Their computer-designed tread lets you run along at turnpike speeds, then pull off the road (even into snow or mud or sand) and keep on going.

Two pairs of Firestone tires teamed together to provide your camper with stability, traction, and long tire life.

They work! Take it from Steve (write to him C/O Firestone, Akron, Ohio 44317 for more information). Or ask your local Firestone Dealer, the man with The System.

**The Wide Oval Tire System
for Campers.**

Firestone

LIVE IN THE WORLD OF TOMORROW... TODAY!

UNUSUAL BARGAINS

NEW PRODUCTS • NEW MATERIALS • NEW IDEAS

"FISH" WITH A MAGNET



Go treasure hunting on the bottom! Fascinating fun & sometimes profitable! Tie a line to our 5 1/2-lb. Magnet—drop it overboard in bay, river, lake or ocean. Troll it along bottom—your "treasure" haul can be outboard motors, anchors, other metal valuables. 5 1/2-lb. Magnet is war surplus—Alnico V Type—Gov't cost \$50. Lifts over 150 lbs. on land.

Stock No. 70.571H\$14.00 Ppd.

Stock No. 60.215H1 1/2 lbs.\$ 5.75 Ppd.
Stock No. 70.570H3 1/2 lbs. (lifts 40 lbs.)\$ 6.75 Ppd.
Stock No. 85.152H15 1/2 lbs. (lifts 350 lbs.)\$33.95 FOB

GIANT WEATHER BALLOONS



"Balls of fun" for kids, traffic stoppers for stores, terrific for amateur meteorologists. Create a neighborhood sensation. Great backyard fun. Exciting beach attraction. Amateur meteorologists use to measure cloud heights, wind speed and temp. Made of heavy-duty neoprene. Inflate with vacuum cleaner or auto air hose; or locally available helium for high rise.

Stock No. 60.568H (8' size)\$2.00 Ppd.

Stock No. 60.632H (16' size)\$7.00 Ppd.

AMERICAN MADE OPAQUE PROJECTOR



Projects illustrations up to 3" x 3 1/2" —enlarges them to 35" x 30" if screen is 6 1/2 ft. from projector, larger pictures if screen is farther away. No film or negatives needed. Primarily intended for children. Projects charts, diagrams, color or black-and-white in darkened room. 115 v. A.C. 6 ft. cord and plug included. Size 12" x 8" x 4 1/2" wide. Weight 1 lb. 2 ozs. Plastic case.

Stock No. 70.199H\$8.75 Ppd.

3" ASTRONOMICAL TELESCOPE



See moon shots, orbits, stars, phases of Venus, planets close up. 60 to 180 power. New improved aluminized, over-coated 3" diam. f/10 primary mirror, ventilated cell. Equatorial mount with locks on both axes. 60x eyepiece and mounted Barlow lens. 3x finder telescope, hardwood tripod, FREE: "Star Chart," "How To Use Your Telescope" book.

Stock No. 85.050H\$32.95 Ppd.

Stock No. 80.162H\$10.00 Ppd.

DELUXE 3"\$59.50 Ppd.

Stock No. 85.105H4 1/4"\$94.50 Ppd.

Stock No. 85.086H6"\$239.50 FOB

ASTRONOMICAL TELESCOPE KITS



Grind your own mirror for powerful telescopes. Kit contains fine annealed pyrex mirror blank, tool, abrasives, diagonal mirror, and eyepiece lenses. Instruments you build range in value from \$75.00 to hundreds of dollars.

Stock No. 70.003H\$10.75 Ppd.

Stock No. 70.004H\$16.95 Ppd.

Stock No. 70.005H\$24.50 Ppd.

Stock No. 70.006H10" diam.\$44.50 FOB

Stock No. 70.007H12 1/2" diam.\$72.50 FOB

AMAZING NEW WANKEL ENGINE KIT!



Thrill to the fun of building your own see-through motorized model of revolutionary pistonless type engine. Only engine experts think economically modifiable to meet new pollution standards. Replaces piston, cylinder, crank assemblies with rotating discs (sections removed for firing chambers). Smaller than conventional; fewer parts, greater reliability, same speed w/less horsepower. Feat: flashing plugs, rubber fan belt, stick-shift on-off switch. Req. 2-1.5V batt. (not incl.).

Stock No. 71.424H(4 1/2" X 5" X 9")\$6.75 Ppd.

519-Page Wankel Engine Book\$15.25 Ppd.

Stock No. 9.439H\$15.25 Ppd.

MAIL COUPON FOR GIANT FREE CATALOG



148 PAGES! MORE THAN 4,000 UNUSUAL BARGAINS

Completely new 1972 Catalog. Packed with huge selection of telescopes, microscopes, binoculars, magnets, magnifiers, prisms, photo components. Ecology and unique lighting items, parts, kits, accessories—many hard-to-get surplus bargains. 100's of charts, illustrations. For hobbyists, experimenters, schools, industry.

EDMUND SCIENTIFIC CO.
300 Edscorp Building, Barrington, N. J. 08007
Please rush Free Giant Catalog "H"

Name
Address
City State Zip

EDMUND SCIENTIFIC CO. 300 EDSCORP BLDG.
BARRINGTON, NEW JERSEY 08007
ORDER BY STOCK NUMBER • SEND CHECK OR MONEY ORDER • MONEY BACK GUARANTEE

SCIENCE WORLDWIDE

(Continued from page 28)

and—snip, snip—the tonsils are removed. The procedure reportedly takes but a few minutes.

The environment

A COLD PIPELINE that would carry oil emulsified in brine is proposed as a solution to the problem of shipping crude from Alaska's North Slope. The method was devised by a Stanford University scientist who says that lab experiments show it's feasible to use a pipeline with interior temperature of from 20° to 30°F. Cold mixtures of 50 percent North Slope crude oil in brine flow as easily as the oil alone at 130° F., according to the researcher. A cold pipeline would not thaw Alaska's permafrost, an environmental danger that conservationists associate with the hot pipeline now being planned.

A HUGE FLOATING "EGG BEATER" restores oxygen to a section of water in the vicinity of a cardboard manufacturing plant



on England's River Thames. Discharge from the factory adds 5 million gallons of de-oxygenated water a day to the river, periling what little life it manages to support. Powered by a 200-hp motor, the beater's blades can aerate the water almost to a point of oxygen saturation, say company spokesmen, who now are thinking about organizing a fishing competition in the river.

SIGN OF THE TIMES: Bottled spring water from Scandinavia is finding a ready market in the Netherlands, Germany, Belgium and Britain—countries where the local product must be heavily laced with chemicals to insure safe drinking. ★ ★ ★

WIN A YAMAHAULER



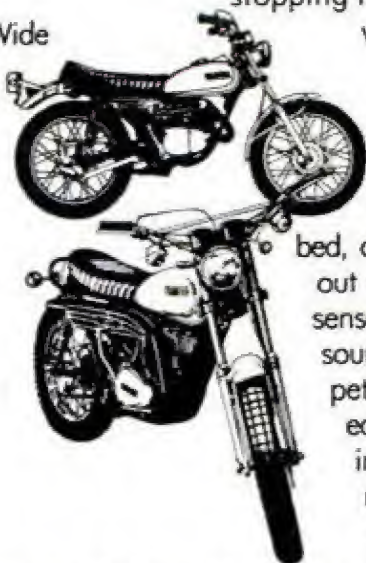
DODGE TRADESMAN B200

Custom Features Include

- Headers, Mag Wheels & Ignition by Cragar
- Goodyear Custom Wide Treads
- Sears Heavy Duty Shocks & Instruments
- Willard-Exide Juice Box Battery
- Craig Stereo Sound
- Tilt Steering Wheel by Grant
- Electric Sunroof by American Sunroof
- Custom Upholstery & Interior by Tony Nancy
- Custom Paint by Bill Carter
- Engine Dress-up by Cal Custom
- Custom Awning by Carter Shade
- AC/DC Converter & Safety Equipment by Rocket Industries

OTHER GREAT PRIZES

- (10) **2nd Prizes:** Yamaha Mini Enduros
- (10) **3rd Prizes:** Screamer Custom Wheels by Cragar (Set of 4)
- (10) **4th Prizes:** Goodyear Custom Wide Treads (Set of 4)
- (12) **5th Prizes:** Complete sets of S-K Wayne Hand Tools
- (25) **6th Prizes:** Yamaha Official Racing Team Jackets
- (25) **7th Prizes:** Hot Rod Magazine 1-year subscriptions



Here's the contest you've been waiting for! First prize is a fabulous \$10,000 custom Dodge Van and two new Yamaha motorcycles (250cc and 125cc Enduros). The Yamahauler Dream Van is completely custom designed by Hot Rod in their traditional show-stopping manner. It's a luxurious workshop on wheels, with a list of super-custom extras as long as your arm: custom exterior paint patterned after the official colors and graphics of the Yamaha racers, plush custom-built and richly upholstered interior, convertible bench/bed, custom compact refrigerator, hand fold-out workbench complete with power tools, sensational 4-speaker AM/FM/Tape stereo sound, cool Frigiking air conditioning, carpeting throughout, custom performance equipment, open-air sunroof, custom loading ramps for the bikes, and much much more for hauling your new Yamahas in grand style.

ENTER AT YOUR YAMAHA MOTORCYCLE DEALER

No purchase is required. You simply stop by your nearest participating Yamaha dealer and fill out an entry blank. (Or mail a self-addressed, stamped envelope to Yamahauler Contest, P.O. Box 611, Rosemount, Minnesota 55068 for your entry blank.) This is a skill contest. You answer three multiple choice questions (Tip: your dealer will help you with these) and then tell us in a few words "Why or how you would make good use of the custom Yamahauler Dodge Van and a pair of Yamaha motorcycles." You must be a licensed driver to enter. Winners will be determined on the basis of originality, creativity and awareness of Dodge and Yamaha features. The Dodge Yamahauler Contest ends September 30, 1972. All entries must be postmarked by October 3, 1972, and received by October 10, 1972. All prizes or alternates will be awarded. Winners will be notified by mail no later than Oct. 20, 1972. Contest valid at participating Yamaha dealers in continental United States and Alaska. Void where prohibited or restricted by law.

YAMAHA

The great machines for '72

You'll never have a better opportunity to win your Dream Van, so visit your nearest Yamaha dealer today and enter!

Two trail riders from Attex

By JOHN LINKLETTER

POWERING HIS WAY up a steep incline, Scott (above) takes a hill with his Sport 5.30. At right, he pulls his bike alongside John's Sport 2.40 to talk things over. Below: John zips along a rocky trail on the 2.40. Both Attex bikes are powered by Sachs two-cycle engines



"SAY GOOD THINGS about those bikes" was the firm warning from sons Scott and John as I took to the typewriter.

Their word goes, because they're the experts in this case. They rode the Attex Sport 2.40 and Sport 5.30 for weeks on paving, on rocky trails in back-country Connecticut, in mud and in snow. The bikes survived the enthusiastic use in good style, and the boys had fun—which, after all, is the point of having the machines.

The two cycles are new in the Attex lineup and fit into that group PM calls *The Minicycle—a whole new breed of bike* (page 140, Oct. '71 PM). (Also carrying the Attex label is a group of rugged all-terrain vehicles, all of which are products of the ATV Manufacturing Co., Glenshaw, Pa.)

The Sport bikes are handsome, with lots of chrome and bright enamel. Both have headlights, speedometers and are powered by Sachs two-cycle engines. Those engines produce a surprisingly quiet purr that's hardly audible in a house when the bikes are in the driveway. The 2.40 has a

SPECIFICATIONS

Model	Sport 2.40	Sport 5.30
Engine displ. (cc)	47	49
Hp	2.4	5.3
Speeds	2	5
Length overall (in.)	57	57
Height overall (in.)	37	37
Width overall (in.)	27.5	27.5
Ground clearance (in.)	6	6
Tire size	3.00x10	3.00x10
Wheels (in.)	10	10
Dry weight (lbs.)	100	115
Starting system	Pull	Kick
Brake operation		
Front	—	Hand
Rear	Hand	Foot
Price	\$295	\$365

two-speed automatic transmission that slips smoothly into high as you give it throttle. The 5.30 has a five-speed foot shift that took the two boys a few minutes to master, but they wound up liking that bike the better of the two. ★★



TOOLKIT, hidden under the saddle, is a standard—and very handy—bit of equipment on each bike

SIDE BY SIDE, both bikes, with handlebars lowered, fit into our Dodge station wagon with room to spare



LEARN TO BE A SKILLED LOCKSMITH



Change combination of pin tumbler cylinder
EARN \$1.50 in 15 MIN.

TYPICAL JOBS EARN YOU \$271 PART TIME (in only 53 hours!)

Owner loses key; pick car trunk—
EARN \$5.50 in 10 or 20 MIN.



Install new knob door lock—**EARN \$15.00 in 30 MIN.**



After-hour emergency opening—**EARN \$2.50 to \$5.50 in 20 MIN.**

Hundreds have succeeded like these Belsaw Graduates:

R. W. Davis, St. Louis, Mo.: "I am doing a wonderful business thanks to your course in locksmithing. Last Saturday I took in \$110.00."

Pierson Crook, Los Angeles, Calif.: "I am making \$200 a month extra income with the Belsaw Locksmith Course. I would recommend your course to anyone."

Big demand for skilled Locksmiths! Earn big money spare time in your own home. Be your own boss. No layoffs. Steady year 'round income. Age and schooling are no handicap.

BELSAW INSTITUTE training...approved by master locksmiths...helps you start faster with easy picture lessons guided by your own mail instructor.

Get thorough job training on all types of locks. We supply tools, equipment and business help: how to start, how to charge, how to get jobs, how to earn while you learn and build a lifetime cash-profit business. Accredited Member National Home Study Council. Approved by State Board of Education. Approved for Veterans.



This \$125 key machine is yours to keep!

MAIL COUPON—NO SALESMAN WILL CALL

**BELSAW INSTITUTE, 103P Field Bldg.
Kansas City, Mo. 64111**

Send **FREE** book, "Keys To Your Future!"

FREE BOOK

Name _____

Address _____

City _____ State _____ Zip _____

Get a little in the Navy

More job.

If you qualify, we can guarantee you any one of 68 job fields. What's more, we'll send you to a school that will make you a real pro. That way, you get more jobs in the Navy and when you get out, you've got somewhere to go.

More choice.

There's a new 3 year Navy enlistment. So you can come in for 6 years or 4 years or now, 3 years.

More guarantees.

You can be guaranteed East or West Coast and choice of sea duty or airman recruit work.

More travel.

See Africa. See Europe. See Japan. Join the Navy and see the world. (It's still true.)

More bread.

New guys now earn \$288 a month. (Congress gave us a raise.)

more

More hair.

You can wear a beard (nicely trimmed) if you want to. It's a Naval tradition. It's also a brand new Navy.

More freebies.

Besides free travel and free education and that \$288 a month, you get free food and free clothing and free housing and free health care and 30 paid vacation days per year.

If you think you've got what it takes to make it in the new Navy,

Call:
800-424-8880

It's toll free, there's no obligation, and a real live Navy recruiter will answer all your questions 24 hours a day, seven days a week. In Washington, D. C. call 433-2000

Or:

See your Navy man right now. He's listed in your phone book under U.S. Government, Navy. He's got all the answers—or he knows where to find them.

Or:

Send to: Captain Donald E. Oglevee
Building 157, Fourth Floor,
Washington Navy Yard,
Washington, D.C. 20390

61

I want to know more about:

- ☐ More job, training, education.
- ☐ The new 3 year enlistment.
- ☐ More travel.
- ☐ Guaranteed East or West Coast home port.
- ☐ More bread.
- ☐ Enlisting now, reporting 6 months later.
- ☐ I want to know more right away. Call me.

My phone No. (____).

- If you really don't want to wait, call us toll free right now at: **800-424-8880**
In Washington, D. C. call: 433-2000

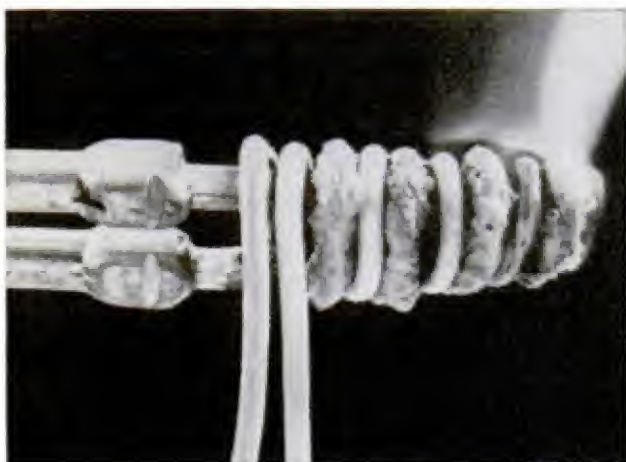
Name _____ Age _____

Address _____

City _____

State _____ Zip _____

NEW IN ELECTRONICS



HEAT-RESISTANT INSULATION of irradiated PVC (right strand on soldering-gun tip) stays intact long after regular PVC (left strand) is a smoking ruin. It's also more resistant to cut-through, abrasion and crushing. Type RX-7000 wire at electronic distributors, price according to size. Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, N.J. 07207.



LOW BATTERY DRAIN on this new, portable FET volt-ohm-milliammeter means you can leave it on indefinitely without finding a dead battery next time you use it. Other features include automatic polarity switching, a low-power ohms circuit that won't bias transistors, simplified zero adjustment. Model 603, \$150. Triplett Corp., Bluffton, Ohio 45817.



TWO OMNIDIRECTIONAL SPEAKERS take different approaches. Hegeman I (left) aims its 8-inch woofer and 1-inch tweeter up and out (inset), radiating sound hemispherically. Design Acoustics' D-12 radiates sound spherically using 11 drivers (9 tweeters, 1 direct-firing mid-range and a 10-inch woofer) in a 12-sided enclosure. We've heard both—they're worth hearing. Hegeman I, \$199 pair; Hegeman Labs, 440 West 34th St., New York, N.Y. 10001. D-12, \$325 each; Design Acoustics, Box 2722, Palos Verdes, Calif. 90274.



MORSE-CODE TELEPHONE for the deaf and dumb has built-in telegraph key and dot-dash printer. The 4½-pound unit uses transistorized circuits, operates on battery or a.c. power, is portable, works with any phone, including payphones. No permanent connections are needed—just set the telephone receiver in a cradle on the unit. To receive calls, a flashing light, attached to the phone line, serves as a "bell." Fonomorse, about \$210. Bruno Fracassi, Via Michaelangelo Pinto 22, 00149 Rome, Italy.

(New in Electronics [continues on page 38](#))

POPULAR MECHANICS

ASK THE AC ENGINEERS

“What are the advantages of AC's new,
improved spark plug insulator?”



AC's new spark plug insulator, now made with an improved alumina ceramic material, helps increase reliability and durability.

Because of the new ceramic material, all AC Spark Plug insulators now have added structural strength . . . improved insulation under high-temperature operating conditions . . . increased resistance

to thermal shock . . . and added protection against corrosion.

So, next time, whether you service your own car or have it done, be sure to ask for reliable ACs.

Remember, there *is* a difference in spark plugs.



AC SPARK PLUG DIVISION OF GENERAL MOTORS

NEW IN ELECTRONICS

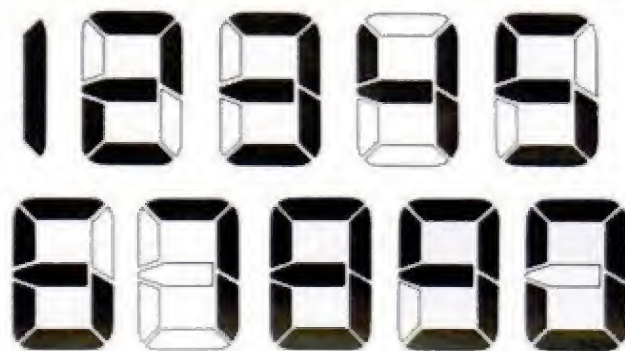
(Continued from page 36)



PICTURE RADIO. New SoundScene radio from GE holds four photos or clippings up to 3 3/8 inches square; hinged pressure pads keep them in place. Speaker and on-off switch are on top; preset volume and AM tuning on bottom. Model P2755, \$12.95 with battery. General Electric, Audio Dept., Syracuse, N.Y.



KEEP YOUR EYES on the probe of this new multimeter, and you can read what function you're measuring (ohms, d.c. or a.c. volts), polarity, data and decimal points, with no danger the probe will slip off the test point. Probe fits in meter, too, for conventional readout. Model 167, \$325. Keithley Instruments, 28775 Aurora Rd., Cleveland, Ohio.



NO HANDS, or other moving parts, in this new, all-electronic watch. Time is shown digitally on a liquid crystal display whose seven transparent segments turn white when voltage is applied. Timing is by a quartz-crystal oscillator, whose 32,768-Hz. output is divided in half 15 times to yield one timing pulse per second. Accuracy within five seconds per month and year's battery life are claimed. Walchorn, \$200. Waltham Watch Co., 231 South Jefferson St., Chicago, Ill. 60606.



POLICE-CAR FACSIMILE SYSTEM transmits maps, photographs of suspects and missing persons, written messages, stolen-car lists and other information to squad cars in Bristol, England. Facsimile transmissions can't be intercepted by ordinary radios or misunderstood. Messages are 4 1/2 inches wide and as long as needed. Equipment costs about \$1500 per car: most of it fits in the trunk.

Warner Programs are Your Guide to Financial Security and Success

INSTANT MONEY...

Plastics are the wave of the future—now you can become a part of this industry. Start in your spare time to build your own future. Imagine, you can turn 25¢ worth of raw material into finished products that sell for \$3.00. You become a Warner distributor and reap the full benefits of its over 50 years experience in know-how and help. Three exciting fields for Immediate Profits... and any man, regardless of age, education or experience can learn. Warner methods guarantee your ability to *succeed!*

BIG INDUSTRY...A.I.G.*

One little-known fact about the electroplating industry is that there are 5,000,000 or more new customers every year! Yet this segment of the metalizing business is only 1% of the market potential! One small, independent operator (who started in his spare time, at home) ran his metalizing business to an annual volume of \$1,000,000.00 within four short months! Don't procrastinate... **INVESTIGATE!** Find out for yourself how you can become a part of the *American Industry Growth picture.



NEW PROCESS...

The Multi-Million dollar a year marking industry is now within reach of the small independent operator. Warner's research has produced a revolutionary new process which allows you to enter this field. The Warner method and quality is equal to the best in the field... and *your service* (the basis of any business) can assure you earnings up to \$16.50 per hour in *your Spare time!*

SECRETS OF...

Are you worth \$25,000.00 a year and do you want to be your own boss?

Warner's newest shop is a unique breakthrough in the Engraving field. It is not—and we repeat, **NOT**—direct selling. It is a business that knows no season... yet it is a business that will never be taken over by the giant corporations. In fact, *they will want you as a supplier!* Now, Warner makes it possible for you, the independent businessman, to cash in on this once-in-a-lifetime opportunity... **ON THE GROUND FLOOR!**

Many Operators Have ALL 4 Shops...

**JUST A POSTAGE STAMP
BRINGS FULL REVELATION
OF ALL THE FACTS...**

The Warner Electric Company, Dept. CS-2-BJ
1512 W. Jarvis Ave., Chicago, IL 60626
Please send me full information on the shop I
have checked below. I understand there is no
obligation and no salesman will call.

- | | |
|--|-------------------------------------|
| <input type="checkbox"/> Laminating | <input type="checkbox"/> Metalizing |
| <input type="checkbox"/> Rubber Stamps | <input type="checkbox"/> Engraving |

NAME _____

ADDRESS _____

CITY &
STATE _____

ZIP
CODE _____

This is *your* opportunity to own your own business — start it in your spare time — the **WARNER-WAY** will even help you finance it — earnings can be as high as \$36 per hour! **EACH ONE OF THESE SHOPS CREATES BUSINESS FOR THE OTHER.**

OVER HALF A CENTURY of providing the "tools" for success in business for those who earnestly want to be independent and enterprising. Let us send you full information without obligation.

The WARNER ELECTRIC COMPANY, Inc.

Dept. CS-2-BJ, 1512 W. Jarvis Ave • Chicago, IL 60626

MAIL COUPON TODAY!

**BUILDING PROFITS FOR PEOPLE
FOR OVER HALF A CENTURY**

LET YOUR MAILMAN BE YOUR BANKER !

1972 Urban Vehicle Design Competition:



They plan to win with hydrogen

UCLA TEAM is betting that its hydrogen-fueled Gremlin X will run away with low-emissions honors

IT ALL BEGAN in the summer of 1968 as the Clean-Air Car Race between MIT and Caltech (See *Across the USA With MIT's Electric Car*, page 52J, Nov. '68, PM). The race captured the imagination of students across the country, and in 1970 there were over 50 entries (See, *Who Really Won the Clean-Air Car Race?* page 40, Nov. '70 PM). This year, on Aug. 9, at the GM Proving Grounds in Milford, Mich., more than 1000 ecology-tuned engineering students from 80 colleges and universities will pull the wraps off 93 of their own creations in an enthusiastic attempt to help the nation, and the auto industry, find feasible answers to urban congestion and pollution.

The three-day competition won't be a race or a styling contest, but a hard-nosed scientific look at students' solutions to urban problems of congestion, safety, and pollution. As such, the Clean-Air Car Race has been renamed the Urban Vehicle Design Competition. UVDC entries will be judged by professional drivers, engineers, and scientists on exhaust emissions, safety, estimated consumer costs, handling,

When the cars are ready to run on Aug. 9, four of the teams will be high on hydrogen—as the fuel that will burn up the opposition!

By **WILLIAM L. PETERSON**



EMISSION LEVELS of hydrogen system are checked in UCLA dyno lab by team co-captain, Frank Lynch

POPULAR MECHANICS

acceleration, braking, noise, turning radius, "parkability" and "drivability."

As a fuel, hydrogen has gained acclaim in only the aerospace industry. Yet, four schools plan to run with hydrogen—the University of California at Los Angeles, Arizona State, Southern University, and the University of Miami.

Well along in hydrogen research is the team from the University of California at Los Angeles (UCLA). Under the supervision of Prof. Albert F. Bush, a full professor in both engineering and public health, team members Ned Baker, Joe Takahashi, Johnny Lu, and co-captains Joe Finegold and Frank Lynch will enter a hydrogen-fueled 1972 American Motors Gremlin X incorporating a liquid hydrogen supply system and powered by a Ford 351 "Boss" engine. Intrigued with the properties and potential of hydrogen, the UCLA team chose the fuel for two reasons: the natural abundance of hydrogen and its clean burning.

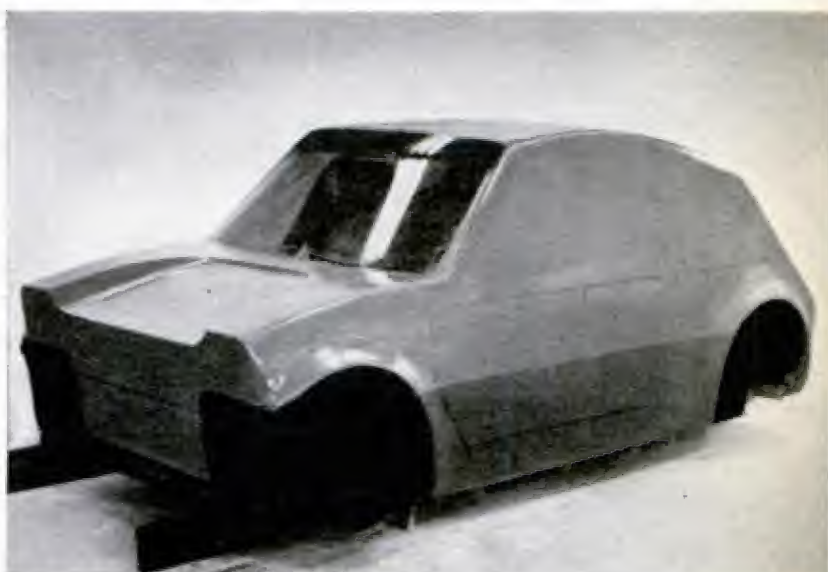
Hydrogen is found in all water (the H in H_2O), and in all present fossil fuels (oil, coal, methane). It is odorless, lightweight, nontoxic, and easily converts into heat energy. Presently, it is commercially produced from fossil fuels by a process called steam reforming. With sufficient electricity, hydrogen can be produced with almost 100 percent efficiency by electrolysis—simply passing a current through water.

When hydrogen and pure oxygen are mixed and then ignited, all that occurs is a violent release of heat energy and all

that is formed is pure water! There is no carbon monoxide, carbon dioxides, no lead oxides, and no smoke. This characteristic has fascinated scientists for years, making hydrogen seem an obvious fuel for the internal-combustion engine, but it does have its problems. Because hydrogen burns so readily, it often causes premature combustion and a diesel-like knocking or rattling. Some solutions include cooling engine hot spots with "colder" plugs, using sodium-filled valves, reducing excessive valve overlap, and attempting to control fluffy carbon deposits by stricter oil control. Burning hydrogen in an i-c engine also produces unacceptable levels of nitric oxides (NOX) and NOX is the major smog-builder.

UCLA's team has solved most of these problems. Early in their research they found by flowing 100 percent excess air through the engine, they could reduce NOX levels to barely measurable parts per million (ppm). After researching several engines, they selected the Ford 351 "Boss" engine. As Frank Lynch explained, "It is such a beautiful breathing engine. It is lightweight and noted for its high volumetric efficiency."

They installed an Impco two-barrel propane carburetor (altered slightly to accept hydrogen), dropped the compression ratio from 11.7:1 (stock) to 7.8:1 by fitting low-compression pistons, machining out the combustion chambers, and polishing all edges on both to minimize hot spots. Sodium-filled exhaust valves and precision guides were substituted, and



DESIGN FROM THE GROUND UP is the approach of Western Washington State College. Car uses a chassis of lightweight tubular construction, with ex-

treme Ackerman steering for getting in and of tight spots; polyester body is designed in sections for easy replacement, and i-c engine is propane-powered

cold, retracted-gap sparkplugs installed. A 32° overlap cam was used, the manifold heater eliminated and the passage plugged. Finally, the thermostat was removed to permit low coolant temperatures.

A simple exhaust gas recirculation (EGR) system was designed to tap off, cool, and reroute relatively inert gases back into the induction system to slow the combustion process by decreasing the excess oxygen in the mixture.

The effect of all these changes is impressive. With the EGR system operating, backfiring and preignition have been eliminated. Thermal efficiencies have risen to values more than 50 percent greater than those of gasoline. Originally, knocking began with coolant temperatures of 160° F. or more, but with the EGR cutting the intake by 25 percent, the "Boss" operated smoothly at 212° F.

True, power is reduced by 16 percent, but as Lynch points out, "The volumetric efficiency of a given engine can be in-

With EGR system operating, backfiring and preignition have been eliminated.

creased to give maximum power levels equivalent to gasoline operation. Such increases can be effected by polishing or enlarging manifold passages (fuel condensation is no problem with hydrogen), or by enlarging intake valves. Another solution is to choose a larger than necessary displacement engine. For the UVDC we plan on using two four-barreled Impco propane carburetors just to help the volumetric flow."

Emission levels have been one of the most exciting parts of UCLA research. With the EGR system operating and a lean 45 percent hydrogen mixture being burned, the NOX levels become immeasurably low—less than 100 ppm under all load conditions experienced. Practically an emissionless exhaust.

Transportation and storage of hydrogen is considered by the team to be crucial. They know their 100-liter, "thermos-type," Dewar liquid-hydrogen cylinder (2 feet in diameter by 5 feet in length) will give only 160 miles and is not the answer, but it is the best alternative to gaseous storage. Exhaust-activated hy-

drides (hydrogen-releasing metal compounds), once-promising, are not yet capable of producing enough demand hydrogen.

Then there is the *Hindenburg* syndrome: The team feels that people unnecessarily fear hydrogen. They argue that hydrogen will not autoignite as readily as common propane. The team refers to hydrogen "dumping" tests performed by NASA on the California desert, and underlines the conclusion that although hydrogen flame velocities are higher than those of other fuels, it will not detonate even when completely mixed with air at perfect ratios unless it is compressed or touched off with a blasting cap. The *Hindenburg* did not explode, it burned—and that is a great safety difference.

Overall automobile safety is a big part of the Milford competition, and the team feels it is ready. Although its internal passive restraints are not certain the UCLA Gremlin will have a heavily padded interior to cushion the forgetful passenger who does not fasten his seat belt. Outside, the team will use foam-backed energy-absorbing body panels, a five-mph barrier device, and a roll cage extending through the roof to cleverly form a luggage rack. The liquid hydrogen tank will occupy the usual fuel tank position and will utilize the passing exhaust flow as a heat exchanger to help vaporize the liquid.

One of the team's strongest reasons for converting to hydrogen-fueled vehicles is economic and sociological. The petroleum industry, producing fossil-fuel hydrogen, could survive the changeover by gradually altering its refineries and distribution network for production and distribution of hydrogen as demand increased. Adjustment by the automotive industry would merely result in a slightly modified engine in a slightly modified vehicle.

But the best reason for considering hydrogen comes from L.D. Conta, dean of engineering at the University of Rhode Island, when he says, "Regardless of what is done to develop substitutes for internal combustion engines, at least 100 million more (i-c) engines will be built over the next 10 years, and the kind of air we breathe 10 years from now will depend more on how these engines are built (fueled) than on anything else we might do in the vehicle propulsion field." ★★

So dependable, it even has a 50-year guarantee

Completely silent, endlessly smooth-working—the ideal, do-it-once permanent replacement for noisy, fast-wearing click switches. If your SUPER SWITCH should fail for any reason in normal home use within 50 years of purchase, just return old switch to us and we'll mail you a free replacement. Standard or lighted handle (for bathrooms, stairways, etc.), for single or two-switch circuits. In electrical departments everywhere. Send coupon for more information and FREE booklet of wiring tips.

Free Do-It-Yourself Wiring Booklet

Wiring Device Business Dept., General Electric Company, Providence, R.I. 02904.

Please send me your illustrated booklet, "Handy Tips about Electricity and Wiring," and more SUPER SWITCH information.

Name _____

Address _____

City _____ State _____ Zip _____

GENERAL  ELECTRIC



SUBSCRIBER'S

Change of Address Form

Please use this form to notify us at least six weeks before you move to your new address.

1. Present address: Attach address label from a recent issue, or print your name and address exactly as shown on the label.

NAME _____			
ADDRESS _____			
CITY _____	STATE _____	ZIP _____	

2. Fill in new address:

NAME _____			
NEW ADDRESS _____			
CITY _____	STATE _____	ZIP _____	

3. Mail this form to:

POPULAR MECHANICS

Subscription Service Dept.

Box No. 646

New York, N.Y. 10019

AUGUST 1972

EUREKA!

**YOU HAVE
FOUND IT.**



WD-40 the original multi-purpose spray that makes anything that works — work better.

It will lubricate all moving parts... sliding doors, drawers and locks.

It will penetrate to free rust "frozen" or corroded bolts or sticky mechanisms.

It will protect metal from rust and corrosion and provide fine lubrication.

It will dry out motors, electrical systems wiring and breaker points.

MAKES LIGHT OILS OBSOLETE

for a SAMPLE and free brochure
send 25¢ in coin to

WD-40 COMPANY

5390 Napa St., San Diego, CA 92110

"I've had complaints with other brands of gasoline. Never a complaint with Shell."

Excerpts from an interview with Jim Herlinger. A man who knows cars, races them, and believes in Shell gasoline.

SHELL: What do you do for a living, Jim?

HERLINGER: I'm working at Hewlett Packard. I'm market manager for systems sold to the auto industry.

SHELL: And in addition to that, you race? How long have you been racing?

HERLINGER: Since 1964, when I went through SCCA drivers school in a Porsche Speedster. For one reason or another, mainly expense, I gave up on the Porsche and got in the Formula Vee just as the class was getting started. I ended up the Northern Pacific Champion a couple of times, San Francisco Regional Champion once. Went to the National Championship with the car twice. In the National Championship they take the top 21 drivers out of 3,000 Formula Vee drivers, so that's kind of a prestigious thing—to be invited.

SHELL: What made you take up motor racing?

HERLINGER: I've always had an avid interest in automobiles and have been playing with cars in one form or the other since I was 13 years old.

SHELL: I see you have also been racing dune buggies. Do you still do that?

HERLINGER: I still own one. I haven't been racing it. We've raced in the Mexican 1000 several times in Baja, California. That's really an adventure, Baja—untouched territory. You

really get out of the way and off the beaten track. You follow a prescribed route and they make it as tough as they can. That's always been fun. But this year I've decided to go a little faster and I bought the Brabham BT-8 which is a two-seater sports racing car, very much like a Can-Am car, only a little smaller. We're putting a six-cylinder Porsche en-



"This is me with my Formula Vee. SCCA rules stipulate that a Formula Vee is a single seat, open wheel racing car based on Volkswagen 1200 sedan components with restrictive specifications that emphasize driving ability rather than design and preparation of the car."

gine in it. On a road course it should be able to reach 160 mph.

SHELL: Do you consider yourself an expert on engines and things, transmissions?

HERLINGER: Reasonably so.

SHELL: Do you do your own work on the race car?

HERLINGER: Yes, I do all the chassis work and transmission work. I do need some help with the engine.

SHELL: Have you owned any other foreign cars?

HERLINGER: This will be my second Porsche and probably seventh or eighth German car. Lots of Volkswagens and Volkswagen buses.

SHELL: Do you have pictures of those cars?

HERLINGER: Some of them. Not too many pictures of the passenger cars. (*Ed. Note: Some of Jim's own pictures are shown here.*)

SHELL: I understand you drive quite a few miles in your personal cars. What's your estimate?

HERLINGER: I have a Pontiac and we drive it about 15,000 miles a year. The Porsche we drive 20,000 a year.

SHELL: What brand of gasoline do you use most often?

HERLINGER: Most often I use Shell products.

SHELL: Why do you use Shell so much?



"I've owned seven or eight German cars, lots of Volkswagens and Volkswagen buses."

HERLINGER: I've always been happy with Shell products. When I first got out of school I applied for about five credit cards and Shell was one of the two that gave me some credit. It's been a good relationship. I've always used Shell products. I've been happy with the

products. The local dealer here is probably the best station I've ever encountered.

SHELL: How about the performance of the gasoline? Do you have any comments or experience with that? Or any comparisons?

HERLINGER: You know it's hard to judge relative performance in a road car, but I've never had any complaints. I've had complaints



"With my older car, I was Northern Pacific Champion in 1967 and 1968."

with other brands of gasolines. Never a complaint with Shell.

SHELL: No trouble with Shell? You've used Shell in most of your cars and been satisfied with it?

HERLINGER: I've probably used Shell in all my cars at one time or another.

SHELL: What grade of gasoline do you usually buy?

HERLINGER: We use Super Shell in the Porsche and Regular Shell in the Pontiac.

SHELL: Would you recommend Shell to a guy with a sports car?

HERLINGER: Yes, very much so.

Ask our customers.

Shell products perform.



APPLIANCE CLINIC

By PAUL MANN

Sh-h-h-h

What can I do about a terrible clatter that comes from our KitchenAid Superba KDS-16 dishwasher when it runs? Other than this, the machine works perfectly.—Peter Pearson, Birmingham, Ala.

You have to appreciate that it's tough for me to pinpoint the cause of noise without examining the appliance, but I looked at this machine and found that the main solenoid and drain valve are mounted directly on a metal frame. This provides a solid metal path for sound. Try loosening the mounting screws and inserting small heavy cardboard shims between the solenoid and frame.

Sputtering spray iron

I own a Westinghouse Steam-N-Spray iron that has started to spit and sputter. Why?—Raymond L. Early, Bloomfield, N.J.

The temperature is either excessive, internal parts have become coated with oil or grease, or the soleplate steam cavities aren't coated sufficiently with wetting agent. What do you do?

First, fill the tank about half full of water, turn the control to LINEN (dry) position and let the iron heat in a horizontal position for one hour. This will get rid of any oil or grease that may be causing the trouble.

If this doesn't solve the problem, mix a quarter teaspoon of sodium silicate in eight ounces of water and steam this through the iron with the iron set at its lowest steam setting. Be sure you do not operate the spray mechanism with the sodium silicate solution in the tank; allow the tank to drain thoroughly—that is, make sure that all the sodium silicate solution steams itself out.

Sodium silicate can be obtained in a hardware store or an appliance store where steam irons are sold.

Finally, if the problem persists, the thermostat probably has to be recalibrated, though I doubt that the trouble lies here. But if it does, a temperature check

of the iron should be made to the specifications for your model.

Dragging hair dryer

I have a model 202 Oster air-jet handheld hair dryer that is about 10 years old. For quite some time the motor has run as if it were under an unusual strain. I've also noticed a reduction in the output of air. I have oiled the unit, but that doesn't seem to have helped. Do you have any suggestions?—Nora Sue Collins, Enfield, N.C.

You're on the right track with your remedy, because the one major cause of trouble with simple hair dryers is lack of oil in the bearings.

However, to be sure that oil-less bearings are the problem in your case, spin the impeller with your finger. If it stops after only a few turns or doesn't spin freely, get an oil can that has a long, thin spout and fill it with a lightweight household oil.

Put a couple of drops of oil on each bearing and turn the motor on for a few seconds to get the oil inside the bearings. Apply another drop of oil and do the same thing.

If the bearing is very dry or dirty, you may see oil come bubbling back out of the bearings, and it will look black. This is okay. It means that dirt is being flushed out by the oil. Wipe off the dirty oil and continue to apply the fresh oil, a drop or two at a time, until the bearings hold the oil and the hair dryer runs without drag.

Care of nonstick appliances

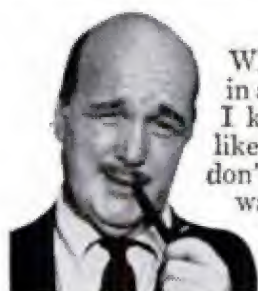
Is it really necessary to use special utensils with Teflon coated appliances?—Mrs. Cynthia Brock, Atlanta.

By "special" utensils I take it you mean such things as rubber, wood or Teflon coated spatulas or spoons for turning or mixing food in nonstick appliances and pans. The answer is no. This is a misconception. Teflon is soft enough to be damaged if you dig into it with a metal utensil, such as a spatula or fork. However, if you employ a little care in handling such utensils, you can use them.

No heat in the warmer

Our Tappan Gallery range has a warmer (Please turn to page 42F)

TOM McCAHILL says: "If your pay check's thinner than a 10 cent hamburger...fatten it up by earning extra money repairing appliances."

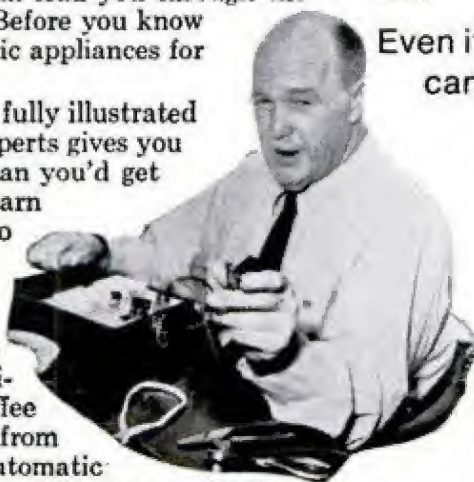


When a fellow tells me his wallet's in about the same shape as my hair, I know how he feels. Salaries are like \$50 Caribbean cruises . . . they don't go very far. But I know one way a guy can get up and go . . . can make himself some real money . . . by learning Appliance repair.

Earn \$5 to \$7 an hour in your spare time.

NRI has a low-cost, home study plan that covers every type of Appliance repair in detail. Even if you're all thumbs and don't know a soldering iron from a steam iron, NRI can lead you through the course one step at a time. Before you know it, you'll be servicing electric appliances for cold, hard cash.

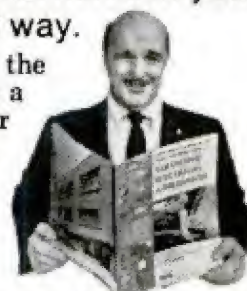
The lessons come to you fully illustrated . . . and the NRI staff of experts gives you more personal attention than you'd get in many classrooms. You learn basic electricity and how to use test instruments, at your own speed. The course covers the electrical and mechanical operation of every type of appliance from toasters and coffee makers to dishwashers; from vacuum cleaners and automatic laundry equipment to air conditioning and refrigerators.



They even show you how to fix farm and commercial appliances and small, one-lung engines. Their staff of experts work with you every step of the way. NRI even includes a professional Appliance tester in the low tuition.

Turn off the TV and learn at home in your spare time, the easy NRI way.

You won't make a buck off the boob tube, but you can make a bundle in the Appliance repair field. (If you're really out to learn, they've got a special course on air-conditioning and refrigeration repair, too.)



Even if you can't wire a plug, NRI experts can teach you all you need to know.

Thousands of guys like yourself have studied with NRI, and they all had one thing in common. They were looking for a way to learn a new skill that would pay off. The Appliance Division of NRI can teach you that skill. Just send in the coupon below for the free catalog that gives you all the details. Send it today and they'll have the book in your hands in no time. Then, it'll be up to you. No salesman will call. The only knocking you'll hear will be opportunity.

Tom McCahill

Grab this FREE BOOK and see what NRI can do for you



NRI TRAINING

3939 Wisconsin Avenue, Washington, D.C. 20016

Send me the free book on Professional Appliance Servicing. NO SALESMAN WILL CALL.

Name _____ Age _____

Address _____

City _____ State _____ Zip _____

Accredited Member National Home Study Council ☐ Check for facts on GI Bill

600-082

AVAILABLE UNDER NEW GI BILL
If you served since January 31, 1955 or are in service, check GI line below.

APPLIANCE CLINIC

(Continued from page 42D)

ing shelf for keeping food warm until we're ready for it. That's our problem. All burners work, but not this shelf. It doesn't get warm nor does its indicator light come on. What do you think is wrong?—John C. Woodworth, Lansing, Mich.

Obviously, this is a localized condition or none of your burners would be working. Electric ranges are wired with a three-wire cable consisting of two 220-volt mains and a ground. If you look in back of your range you may spot this wiring. You'll see three terminals. In most installations, the two outside leads are "hot," and the middle one is the ground connection.

If anything were wrong at this point, nothing would be working. However, the warming shelf, which is turned on and off by a switch, has an element beneath it that is "fired up" by a lead coming off a main lead. Most likely this wire is loose or has burned off, although it's also possible that the switch controlling the element is defective.



Drives away bloodthirsty female mosquitos (males do not bite). Does away with greasy, sticky, smelly lotions and sprays that have to be continually reapplied. Perfect for camping, fishing, hunting and other outdoor activities

EFFECTIVE RANGE BETWEEN 3 TO 8 FEET WITH ORIGINAL BATTERY LIFE OF UP TO 100 HOURS

SOLD WITH MONEY BACK GUARANTEE

If not available through your local sporting goods dealer, send \$9.95 check or money order—no C.O.D.'s—Calif. res. add 5% sales tax.

Sports Alliance, Inc.

12016 WILSHIRE BLVD., LOS ANGELES, CALIF. 90025
(213) 272-9503



PORTABLE WATER PURIFIER

COMPLETELY SELF CONTAINED
REUSABLE • DELIVERS UP TO 20
GALLONS AT 3 MINS. A PINT

Raw

Water In



Pure
Water
Out

Self-contained—weighs only 6 ounces—goes anywhere. Carry it in your pocket . . . hunting, fishing, camping; gives 20–30 gals. of sparkling clear, pure water; nothing else is needed. Sets up in seconds whenever you need it. Delivers the safest, purest water from even the most polluted source of fresh water. Removes parasitic bodies, waste material, sediment, suspended solids, harmful minerals, and kills bacteria. Removes all objectionable tastes and odors.

PURIFIES WATER 5 WAYS: SEDIMENTATION, FILTRATION, ADSORPTION, DISINFECTION, DEMINERALIZATION

If not available through your local sporting goods dealer, send \$9.95 check or money order—no C.O.D.'s—Calif. res. add 5% sales tax.

Sports Alliance, Inc.

12016 WILSHIRE BLVD., LOS ANGELES, CALIF. 90025
(213) 272-9503

Maintenance tips

● When you disconnect wires on a timer, switch or whatever, mark them so you know where they belong. Small swatches of adhesive tape marked by a ballpoint pen with the terminal number, letter or a code of your own will work nicely.

● Want to save your fingers? When you turn a motor pulley or test drive-belt deflection, such as on a washing machine, pull the plug from the wall first. People have gotten their fingers mashed when a machine accidentally started.

● In an appliance workbench setup, where you'll be working with electricity, remember for your own safety that the floor must not be grounded—that is, of cement or earth. A dry, wood floor is a good insulator as is one that's covered with either vinyl tile or linoleum. You can build a wooden platform to stand on. ★ ★ ★

If you have a question about any appliance, send it to Appliance Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Sorry, but letters cannot be answered individually. However, problems of widest interest will be answered in this column.

Not too big for your britches.



New Kodak pocket Instamatic® camera.



FREE PLAN *How to Start* Your Own Business



Start a steady repeat CASH business in your basement or garage. Earn \$3 to \$6 an hour in your spare-time! Excellent profits in saw sharpening business! Automatic Foley Saw Filer, easy to operate, files combination saws, hand, band, and circular saws. No experience needed. H. C. Delbert wrote us: "Since I got my Foley Filer 5 years ago, I have averaged 4½ saws each day since I started."

Every saw you sharpen brings you more customers. "I rented a two-car garage and have all the work I can do," writes Charles H. Smith.

FREE BOOK *Shows How to Start*

Fact filled booklet tells you how to start a sparetime business immediately; how to get new business, how to advertise. Rush coupon now; get "Money Making Facts" and details on Easy Payment Plan. No Salesman will call.

Send Coupon for FREE BOOK Money Making Facts

FOLEY MANUFACTURING CO.
816-2 Foley Bldg. Minneapolis, Minn. 55418

Send FREE BOOK—"Money Making Facts",
and Time Payment Plan.

Name _____

Address _____



JOCK ITCH ISN'T SOMETHING TO BE TREATED LIGHTLY.



Jock Itch is a fungous infection. It can become serious.

It can keep coming back even though you try all manner of "remedies," from baby powder to petroleum jelly.

But you can get fast relief with Cruex®, the spray-on medicated powder specifically made to fight Jock Itch.

Cruex soothes itchy, inflamed skin. Cushions against further irritation. And absorbs perspiration

(an important factor in the growth of Jock Itch fungi—tinea cruris). Its medication directly attacks susceptible fungi. And because you spray Cruex on, you can reach into hard-to-get-at places and avoid the sting or burn of rubbing, dabbing, or smearing. So fight Jock Itch seriously (and help keep it from recurring) with cooling, soothing Cruex. Guaranteed to work or your money back.

CRUEX, THE MEDICATED SPRAY SPECIALLY FORMULATED TO FIGHT JOCK ITCH.

©1972 Pharmcraft Division Pennwalt Corporation

Pharm
© PHARMACRAFT

AUGUST 1972

42G



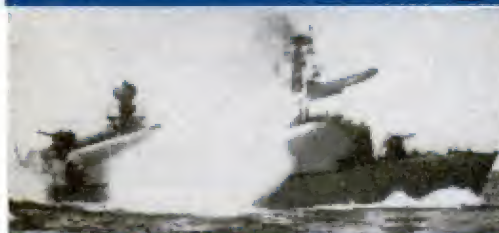
QUICK-CHANGE IDEAS FOR EASY ENTERTAINING

Dozens of ways to spruce up a not-so-finished basement—transform it into a home movie theater, build low-cost serving tables, add hi-fi—all at low cost.



PM'S VERSATILE PIANO BAR

We've designed this unique piece of furniture for party fun, but when the party's over it stores and serves as a buffet under wall-hung shelves in any room in the house.



THE GROWING THREAT OF SOVIET SEA POWER

Coming up fast as a naval power, the Russians have already outstripped us in some ways. Candid assessment of the Russian fleet—and where it leaves us.



YOUR FIRST ELECTRIC CAR

You may rent—rather than buy—an electric car in the future. If you're not sure you want one, you can drive before you buy. One of the largest car-rental companies is studying electrics as rent-a-cars.



TERROR IN THE SKIES

A PM reporter tests security at several of the nation's largest airports and tells what he found. His interviews with air travelers reveal that most would not object to being searched before boarding.

PLUS

What you need to know to pick the right four-channel sound system • Inside look at how television puts you on the 18th green • Mini-Hawk, a slick little home-built airplane • Driver's report on Renault 15 • How to build a modern hall clock, sofa and stack-cube furniture.

Buy it on your newsstand. Better yet, make sure you'll keep getting this kind of exciting fare. Send this coupon with your check to:

POPULAR MECHANICS
250 West 55th Street
New York, New York 10019

Please enter my subscription for ☐ 1 yr. \$5 or ☐ 2 yrs. \$9

Name _____ (Please print)

Address _____

City _____ State _____ Zip _____

Payment of \$_____ is enclosed. ☐ New ☐ Renewal

On new subscriptions, first copy will arrive in about 8 weeks.

(Above prices apply in U.S. and Possessions only. Canada, add \$2 per year. All other countries, add \$4 per year.)

WPM2H1

Who'd have thought I'd make so much money without going to college?



I still have to pinch myself every time I see my paycheck — it seems too good to be true!

Especially when I remember how sorry everyone felt for me because I couldn't go on to college. "Without college, it's a losing battle!" they all said.

Well, the college boys left for school, and I found a job. I worked hard, too, but never made it big.

Then I happened to read an announcement like this... about the exciting job opportunities in Electronics.

I discovered that with proper training I could qualify for a job in many of the fields where the action is today... computers, medical science, pollution control, radio and TV broadcasting, to name just a few. I found out that once I had some experience, I could earn \$12,000 a year or more... the kind of money any college man would be proud of.

Most important — I realized how easy it would be for me to get this training. Right at home. In my spare time.

With a home-study course from Cleveland Institute of Electronics.

It looked like a terrific deal, so I enrolled with CIE... and did I learn fast! I'm happily employed in Electronics now, earning good money in a career that **means** something. It's all so unreal that every once in a while I have to pinch myself.

Without college, I never thought I could do it. But, thanks to CIE there are now some college guys who envy me!

CIE Grads Report Success



"My CIE course gave me the technology I needed to understand many of the electronics concepts I never dreamed I could learn. I'm already earning 30% to 40% more than I could have without my CIE training."

Joe Perry, Cambridge, Mass.



"CIE was undoubtedly the best investment I ever made. Using my electronics training, I started servicing two-way radios and now own my own business. Thanks to CIE, I'm much better off financially and really enjoy my work."

Ed Dulaney, Scottsbluff, Neb.

This composite story is typical of hundreds told by CIE graduates who are now enjoying exciting new careers in Electronics.

Send for 2 FREE BOOKS

So find out for yourself. Ask for CIE's 2 FREE BOOKS, "Succeed in Electronics" and "How to Get a Commercial FCC License." They describe the opportunities open to men with electronics training and show you how CIE courses can prepare you for a meaningful, rewarding career in the Science of the Seventies.

Both books are FREE... at no cost or obligation. Send for them today! Mail reply card or coupon to CIE now... or write: Cleveland Institute of Electronics, 1776 E. 17th St., Cleveland, Ohio 44114.

APPROVED UNDER NEW G.I. BILL

All CIE career courses are approved for full tuition refund under the new G.I. Bill. If you served on active duty since January 31, 1955, or are in service now with more than 180 days of active duty, check box for G.I. Bill information.

CIE Cleveland Institute of Electronics

1776 East 17th Street, Cleveland, Ohio 44114

Please send me 2 FREE BOOKS describing opportunities in Electronics and how to prepare for them.

Name _____
(Please print)

Address _____

City _____

State _____ Zip _____ Age _____

Veterans and Servicemen:

☐ Check here for G.I. Bill information.

Accredited Member National Home Study Council



PM-69

SOLUTIONS FOR MECHANICAL HEADACHES

AUTOMOBILE CLINIC

BY MORT SCHULTZ

Floundering engine

I have an aggravating problem with a Ford Torino. I'll be driving at normal speed when the engine will quit as if it had run out of gas. After a few minutes it will start, but soon the same thing will happen. Can you help?—A.J. Roberts, Rochester, N.Y.

You haven't given me much to go on, but let's try it. If the engine just shuts down—bingo—without so much as a sputter, look for a kink in the fuel line where it comes out of the sending unit at the fuel tank. Some models came from production with lines longer than needed, leading to a kink at the connector. You may have to shorten the line to make sure that it stays straight.

If the engine sputters before it dies, suspect a short in the secondary wiring of the coil.

A solution to every problem

Allow me to share an experience I had with my 1970 Chevrolet Malibu with 350-cu.-in. V8 engine and Turbo-Hydramatic. The car, bought new, has been driven 15,000 miles. From the first day, the engine wouldn't idle properly, even after tune-ups. The transmission shifted late and unpredictably. And when it did shift the jolt was severe.

After two years of tolerating this nonsense, I was ready to trade in the car when a sharp mechanic at a service station found a vacuum leak in the carburetor-to-transmission line. The car now runs beautifully.

I wonder how many poor owners suffer with a similar problem spoiling the performance of a car that costs several thousand dollars?—Robert Lupoff, Miami Beach, Fla.

Thanks. You (and that sharp mechanic) certainly have put other car owners on the right diagnosis of a tricky problem.

Try it—you'll like it

Both of my 1972 Mercedes-Benz automobiles—280 SE and 350 SL—have squeal-

ing noises when the disc brakes are applied. My dealer says it is normal. Can the trouble be corrected?—Dr. Fred Chasan, Torrance, Calif.

Disc brakes are known to do this on many cars. The squeal is caused by the hardness of the pads. If softer pads were used, they would wear out faster. Some service shops I know have been successful in quieting the squeals by removing the pads and applying a product called Brake Silencer, which is made by Kent Industries of Cleveland.

Power politics

I bought a new Dodge Demon in 1971 that has now been driven 6000 miles. In that time, the power-steering unit failed three times. Twice a seal went bad and started leaking; the third time, it was the reservoir. Each repair lasts about 2000 miles, but the dealer refuses to install a new unit. Is he justified?—Robert A. Krieg, Valley Stream, N.Y.

I can't understand his attitude. By this time he should have concluded that the unit was improperly machined to begin with or has some sort of surface warpage. You should demand a replacement. You may have to write the Chrysler New York Regional Office in White Plains, N.Y., and have it referee the dispute.

When partially empty equals full

I have been having trouble with the automatic transmission of my 1967 Buick Wildcat for years. Fluid is thrown out the breather pipe. I thought that maybe the transmission was running too hot, so I installed a transmission oil cooler, but that hasn't helped. What can I do?—C.L. Strom, New England, N.D.

It's possible that a malfunction exists in the transmission, such as a stuck priming valve, but I doubt it. The two main reasons for this problem are a plugged filter on the valve body and overfilling of the transmission. Put in a new filter if it hasn't been replaced for some time.

More important, you should consider the

(Please turn to page 48)

Get a taste of what it's all about. Get the full taste of Viceroy.



This \$200 **HEUER** chronograph—yours for only \$88.

Now wear the Heuer self-winding chronograph of the Parnelli Jones—Viceroy Racing Team for \$88. This 17-jewel watch/stopwatch features: stainless-steel water-resistant case, tachymeter bezel, self-winding movement, date window, recording register from 0-12 hours with a $\frac{1}{2}$ second sweep hand.

Heuer is the official timing instrument at major international races including the U.S. Grand Prix and Sebring 12-hour Endurance Race. To get this \$200 watch with gift case, just send 1 Viceroy carton end flap and \$88 to:

**Parnelli Jones
Viceroy-Heuer Chronograph Offer
Box 3000 B
Louisville, Kentucky 40201**

☐ Check ☐ Money Order ☐ Master Charge
☐ BankAmericard

ACCT. NUMBER _____

NAME _____

I AM OVER 21 YEARS OF AGE

ADDRESS _____

CITY _____ STATE _____ ZIP _____



PM

Please allow 6 weeks for delivery. Void where taxed, prohibited or restricted. Offer expires Dec. 31, 1972.

VICEROY
FILTER CIGARETTES

Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health

AUTOMOBILE CLINIC

(Continued from page 46)

way the transmission fluid has been added. When you check the fluid level, it should be at the **FULL** mark on the dipstick, but only after the transmission has been warmed to its normal operating temperature of 180° F. This requires at least 15 miles of highway driving. If the transmission is *not* being checked under these conditions and fluid is found to be below the **FULL** mark, you will be *overfilling* the transmission by raising the level to this mark. Check with shift lever in **PARK**.

If the transmission is being checked without being warmed up—that is, at a room temperature of 70° F.—the fluid level should be $\frac{1}{4}$ inch *below* the **ADD** mark on the dipstick. If fluid is required, do not bring up the level beyond this point.

Believe it or not, automatic transmission fluid in your Buick needs this much space to expand as it warms up.

Searching for a hot spark

I have a 1968 Chrysler New Yorker with a 440-cu.-in. engine and four-barrel Holley carburetor. Would it be possible to adapt the electronic ignition system being offered by Chrysler for its 1972 440-cu.-in. engines?—Dr. Louis F. Stigliani, DeKalb, Ill.

Yes, you can do it. A good Chrysler dealer can give you the details.

Insidious injector

The car is a 1969 Volkswagen fastback with fuel-injection system. Gas is getting into the oil, forcing me to change oil three times as often as called for by the manual. Why?—W. Rudolph, Warren, Ohio.

For one thing, one or more of the four injectors may be malfunctioning. A little particle of dirt may be preventing an injector from closing completely when it's supposed to. Fuel, under great pressure, may be pushing itself into the crankcase, diluting the oil. Other possibilities include excessive fuel-pump pressure and a faulty injector-system pressure regulator. Unless you have somehow voided your warranty, how come you haven't asked a VW

dealer to correct the trouble under the terms of the two-year or 24,000-mile warranty?

Gassed out

I have a 1970 Oldsmobile 98. When I fill the gas tank, gas runs out if I park on a hill until the gauge drops to three quarters full. Cold or hot weather is not a factor. Can this be corrected?—W.C. Brenneisen, Corapolis, Pa.

I'm surprised it hasn't been. The first thing to be determined is where the gas is coming from. Is it coming out the filler neck? If so, you may have a defective gas cap or filler pipe. Is gas leaking from the fuel tank? If so, a grommet into which the fuel and return hoses fit may have broken loose or the fuel tank sending unit which sits on top of the tank may not be seated properly. Perhaps the gasket beneath the sending unit is defective.

Service tips

● **1972 Plymouth Duster owners:** To keep the tail-lamp socket and bulb of a 1972 Plymouth Duster from falling out, have your dealer add a screw to the base of the housing below the socket. The fix is outlined in service bulletin 08-09-72C.

● **Volkswagen** says that wet weather starting problems with Beetle models may be caused by arcing between the braided, green vacuum hose from the carburetor, and the terminal on the ignition switch side of the coil. Push the hose away from the terminal as far as possible. The hose is stiff and will stay where you place it.

● **1971 Camaro owners:** If you don't believe you're getting sufficient air from the airconditioner ducts, you may be right. Situations have occurred where Vega airconditioner blower motors, which look like those of the Camaro, have been installed accidentally in the Camaro. The Vega motor revolves in the opposite direction.

● **Oldsmobile** warns that when you install a battery in a '71 or '72 Model 88 or 98, you should make sure that the left-front park-lamp wiring harness isn't accidentally caught beneath the battery.

GOT A PROBLEM WITH YOUR CAR? Ask Mort about it. Send your question to Auto Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Letters cannot be answered individually, but problems of general interest will be published in the column.

Dodge. The only all-new pickup for 1972...with no cover charge.



Buy this specially equipped '72 Dodge Sweptline, and the Dodge Boys can offer you a Winnebago Kap Cover at no extra cost.

FOR '72, ONLY DODGE GIVES YOU ALL THIS:

- All-new styling, inside and out
- New, improved independent front suspension
- More cab room
- Bigger payload capacities in most models
- New car-style cab comfort
- Easy-off tailgate.

PLUS A \$300 VALUE AT NO EXTRA COST.

The Winnebago Kap Cover is constructed of aluminum with insulated

walls and plywood paneling inside. Participating Dealers can offer you this great value FREE because Dodge gives it to them free. See the specially equipped Dodge D100 V8 131-inch wheelbase Sweptline Topper today.

SPECIAL EQUIPMENT INCLUDES:

- Automatic transmission
- Adventurer Package ■ Power steering ■ Tinted windshield
- Electronic Ignition System
- Bright rear bumper ■ 15-inch wheel covers ■ Mirrors, bright, dual, 5" x 7" ■ Heavy-duty rear springs
- Front bumper guards.



*Winnebago and Kap are registered trademarks of Winnebago Industries, Inc.

Dodge brings you the best in baseball Saturdays on NBC. See your local TV listing.

DODGE SWEPTLINE TOPPER

...IT'S A GREAT DEAL BECAUSE DODGE STARTED WITH A GREAT PICKUP.

THE BICYCLE SHOP

By EUGENE A. SLOANE

This month Gene catches up on some of the many cards and letters from readers and answers their questions about bike repairs, tools and touring

Q. *This summer I want to bike from Tampa to Washington, D.C., on my Raleigh Triumph-10 speed. My question is: Will this bicycle or a more expensive one make my trip easier and more enjoyable? I paid \$80 for my present bike. What is the point of diminishing returns on a bicycle used for a long trip?—M.F., Tampa, Fla.*

A. The Raleigh people make fine bicycles, but some are better than others. You get what you pay for. An \$80 bicycle is going to be heavier, more cumbersome and harder to pedal than a lighter machine in the \$300 to \$400 price range. Personally, I'd trade in the \$80 model for a Raleigh Super Course, selling for around \$155, or a Raleigh Gran Sport, around \$210. Anything that costs much less than that is really good for around-town riding only. If you really get into cycling, though, you'll probably wind up paying \$440 for the Raleigh top-line Professional Mark III. The better the bike, the more enjoyment you'll get from it. Other bikes are good, too, but so long as you have a Raleigh you may want to stick with that line.

Q. *I am a "bike freak" who would like to start a basement bicycle repair shop at home. What tools would you advise me to buy?—A.J.D., Chicago*

A. First, be prepared to invest several hundred dollars. The following tools, with approximate prices, will get you started: bike stand, \$150; cone tools, 13, 14, 15 and 16-mm, \$12; set metric box wrenches, 5 to 25 mm, \$25; set metric open end wrenches, 5 to 25 mm, \$20 to \$35; adjustable crescent wrenches, 4, 5 and 6-in., \$30; assorted screwdrivers, \$12; metric allen wrenches, 5 to 17-mm, \$12; Campagnolo, Stronglight, T.A. and Sugino crank tools, \$35; bottom bracket tools for above cranks, \$35; Atom, Schwinn, Regina, Shimano, Maeda freewheel



PHOTO BY BILL HARTFORD

HAPPY LANDING! After the flight, comes the fixin' removers, \$12.50; tire tools, \$3; tire patch kits, \$5; chain-rivet remover, \$3.50; pedal wrench, \$3.50; Campagnolo "T" wrench, \$3.50; spoke wrench, \$2; Campagnolo seat-post tool, \$3.50; plastic-headed mallet, \$3.50.

Q. *I've tried all over Tupelo, but none of the bike shops here carry a chain-rivet-removing tool I need to get the chain off my 10-speed bike. Where can I buy one?—B.N., Tupelo, Miss.*

A. I am surprised that no bike stores in your city carry this tool. Considering the number of 10-speeds being sold today, this is a major item. You can buy one from the bike mail-order store: Wheelgoods Corp., 2737 Hennepin Ave., Minneapolis, Minn. 55408, which also puts out an excellent catalog of bikes and bike parts for \$2.

Q. *Why the terrific price gap between Campagnolo and other good bike parts? If 8.5 million bikes were sold in the United States last year, why aren't more U.S. manufacturers making their own parts? Why isn't it okay to dunk your chain in paraffin after cleaning with kerosene, instead of oil? Paraffin is cheaper.—G.A.L., Onchiota, N.Y.*

A. Three very good questions. In order: Campagnolo parts are simply the very best in terms of precision machining, finish and design. However, the differences can sometimes be minute. For example, the top-line Shimano and Maeda derailleurs are almost as good as the Campagnolo derailleurs, and

(Please turn to page 52)



A special offer for the guy who knows what the underside of a car looks like.

If you've been under a car, you know what's connected to what and why, and you've probably got more than a little Missouri in you. So when someone starts up about his shock absorbers, stop him with a "Show me." We will.

You buy our Pleasurizer H.D.'s and test them for three months. Make them do everything shocks are expected to do, and don't be gentle. If at the end of 90 days you're not satisfied, your participating dealer will give you your money and your old ride back. We're that sure of them.

Delco H.D.'s are stiff. To give improved handling in tough situations. Even if you're running over-

size wheels and tires.

And H.D.'s are tough all around. On long work-outs, the large fluid capacity helps dissipate heat fast. And H.D.'s have a special Genetron® gas filled cushion to prevent air bubbles and the shock lag they can cause.

Your Delco dealer has a complete line of shock absorber replacements for all American-built and most foreign cars. The H.D., the Pleasurizer, and the air adjustable Pleasur-lift. All with the 90-day money-back offer. We're that sure. Stop at the red, white and blue Delco sign. And you can be sure too.

The more you know,
the more you'll want Delco.



THE BICYCLE SHOP

(Continued from page 50)

cost considerably less. It comes down to getting about 10 percent more quality for about 50 percent more money.

As for U.S. manufacturers making their own caliper brakes, derailleurs, chainwheels and pedals for good bikes, the economics of tooling up the machinery and the bricks and mortar investment, plus the fact that no U.S. firms make all the bikes, rule out their making components in competition with foreign suppliers tooled up for some time.

Lastly, paraffin is too gummy and sticky, would attract dirt. Your best bet is Lubriplate Chainlube spray.

Q. Recently I bought a bicycle with coaster brakes. The instruction manual is for a Sturmey-Archer rear hub, but the bicycle has a Shimano hub. Where can I find the Shimano firm to get a manual?—G.M., Niagara Falls, N.Y.

A. You can reach Shimano by writing Shimano American Corp., 1133 Avenue of the Americas, New York, N.Y. 10036.

Q. I have recently become interested in cycling, and have read your book, *The Complete Book of Bicycling*. This book lists several magazines on biking, one of which is *Bicycling!* A letter to this publication was returned. Can you give me its new address?—J.M.R., Syracuse, N.Y.

A. The new address is 15 Sir Francis Drake Blvd., East Greenbrae, Calif. 94904.

Q. I would like some do-it-yourself plans for building a bike carrier. Are any available?—D.R., Rockaway Beach, N.Y.

A. A dandy roof carrier that carries up to five bikes and that you can also use for your boat has been designed by Chick Mead, 137 County Rd., Marion, Mass. 02738. Send him \$1.50 for complete plans and bill of materials.

Q. I would like to buy a Bobet C-34 but cannot find a dealer. Can you tell me where to find one?—T.F., Deerfield, Ill.

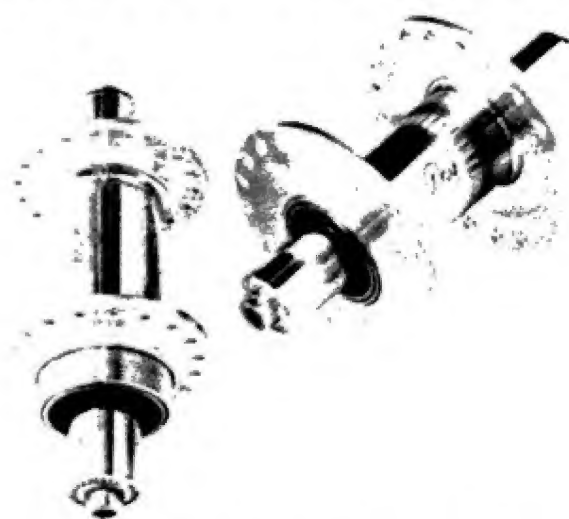
A. Sorry to report the Bobet is no longer imported into this country. However, a Mercier bicycle, made by the same French manufacturer, is available and you should be able to find one at your Deerfield bike shop. But be prepared to spend at least \$200.

Q. Can you tell me what Cantiflex tubing is? I heard of this some time ago via a label on a bicycle made in England.—P.O.S., Albany, N.Y.

A. "Cantiflex" bicycle tubing is made by Reynolds Tubing Co. for Horace Bates Cycles, Ltd., 479 London Rd., Westcliff-on-Sea, Essex, SSO 9LG, England. This patented tubing has twin-radius thickness. The thickness is greater (1¼-inch o.d.) at center sections, slightly thinner (1½-inch o.d.) at ends. Bates says this makes a stronger, more rigid design that is resistant to whip and bending strain. Whip is undesirable in a bike frame (or at least too much of it is) because it robs the cyclist of pedal power by absorbing his pedaling action to some extent. Seat springs do the same thing.

Q. Are there such things as hop-up or speed shops for bicycles? You know, places that soup up bikes with real low-friction parts and things like that.—D.R., Wantagh, N.Y.

A. No. No speed shops yet, but many precision parts are available for bikes. For example, there's a set of precision hubs that feature a sealed design; they're good virtually for the life of the bicycle. Bearings are precision-made so that the rolling resistance is said to be less than that on even the best of conventional hubs. The aluminum alloy hubs are either wide-flange (3 inches)



or standard (2¼ inches). The wide flange retails for about \$44 for front or rear hub, low flange for \$40 each. If you're a bike fanatic, you'll be satisfied with only the very best, which is what these hubs really are. From Phil Wood & Co., Box 1729, Los Gatos, Calif. 95030. ★ ★ ★

GOT A PROBLEM WITH YOUR BIKE? Ask Gene about it. Send your question to Bicycle Shop, *Popular Mechanics*, 224 West 57th St., New York, N.Y. 10019. Letters cannot be answered individually, but problems of general interest will be published in this column.

People pay a lot of money to these men. You can be one of them soon.



Electronics Technician.



Automotive Technician.



**Air Conditioning
Refrigeration Technician.**



**Home Appliance
Technician.**

You know what technicians charge to repair your TV set, your car, refrigerator or washing machine. The men who can do the job — and do it right — get paid very well indeed.

Join them! Be a technician and let people pay **you** for a change.

National Technical Schools will train you at home the professional way — with profes-

sional instruction, tools and test equipment, the kind of equipment you'll be using on actual jobs. It makes home training practical and more fun. And you get to **keep** all of the tools and equipment.

Choose the kind of technician you want to be. **Then** mail the card for free color catalog. No obligation. No salesman will call.



NTS Electronics Division

Multiply your income with space age skills in Computer Electronics. Color TV & Radio Servicing, Automation/Industrial Electronics or Electronic Communications. Courses include valuable kits such as 315 sq. in. Solid State Color TV, Solid State B&W TV, 2-way Radio Transceiver, Compu-Trainer, Oscilloscope, and more. Check card for new **FREE** Color Catalog, complete details.



NTS Mechanics Division

NTS puts you into America's #1 Industry fast. Start earning almost as soon as you begin. You get 109-piece Socket Wrench & Tool Set with case and professional 8-unit diagnostic test equipment, yours to keep. Plus bonus Speed Shop lessons. Check card for new, free color catalog and complete details on all four courses and equipment.



NTS Air-Conditioning/ Refrigeration, Heating Division

Install and maintain today's complex air-conditioning, refrigeration, and heating systems. As an NTS master technician you can handle any job. Or you can go into your own business. "Project Method" makes your training interesting with all new Hermetic Analyzer, tester, and other valuable instruments. Send for new catalog. Check card today.



NTS Home Appliance Division

Boost your income, build a new career, start a business of your own. Learn the professional way to service ranges, washing machines, dryers, home air-conditioners, and other appliances. We'll supply everything you need, including the New Exclusive Circuit Trainer, 4 in 1 Appliance Tester and complete set of fine hand tools. Check Card.

**MAIL CARD NOW
FOR FREE
CATALOG &
SAMPLE LESSON**



Classroom Training at Los Angeles. Train in sunny California. NTS occupies a city block with over a million dollars in training facilities. Check box on card.

NATIONAL TECHNICAL SCHOOLS

WORLD-WIDE TRAINING SINCE 1905
4000 So. Figueroa St., Los Angeles, Calif. 90037

APPROVED FOR VETERANS

Accredited Member: National Association of
Trade & Technical Schools,
National Home Study Council.

Drivin' with Dan

How do you boost pressure on a turbocharger? What will improve racing coverage by television? Would a small station wagon do well in stock-car racing? Dan Gurney answers these and other automotive questions

Q. How do you increase the boost on a turbocharger?—Penny Wallman, Burr Oak, Mich.

A. On most racing applications, there is a pressure-relief valve which can be set to pop off at a given maximum pressure. The adjustment is made with a bolt which acts as a stop. You screw it in for a higher maximum pressure; out for a lower pressure.

Q. After a year of preparation with your amazing new Eagle, after a month of practice at the Indianapolis Motor Speedway, after all that investment and sweat, was it really a broken distributor rotor that grounded high-flying Bobby U. in the 500?—Bob Kattau, Massapequa, N.Y.

A. Yup.

Q. I like to watch racing on TV, but I have never felt it is as good as it could be. If you agree, what

could you suggest might be done?—Al Ostrinski, St. Louis.

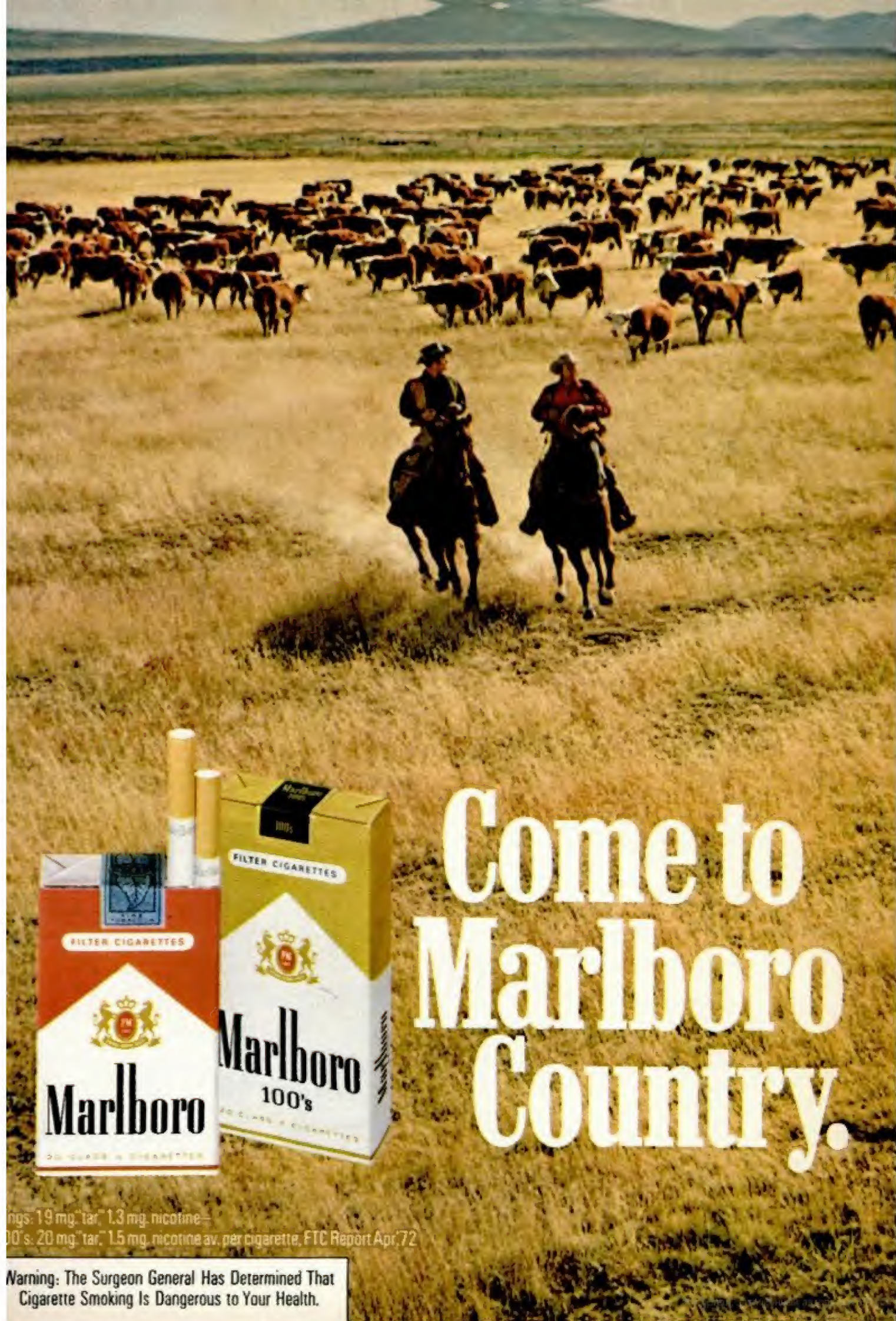
A. I agree, although television coverage is improving all the time. I believe that the networks could use cameramen with auto-racing insight to follow the real action—not necessarily just the leader as he goes round and round. Also good would be a few more interviews with drivers and team managers as the race is underway, more pit action, more "inside" stuff.

Q. If you see you can't make a curve, is there any way to spin out a car quickly and safely like they do on a racetrack?—Ralph Simpson, Corbin, Ky.

A. If you did do it, you were lucky. What you
(Please turn to page 60)

POLE SITTER, Bobby Unser, takes his seat for the Indy 500 with team manager, Dan, calling the strategy





Come to Marlboro Country.



ings: 19 mg. "tar," 1.3 mg. nicotine—
10's: 20 mg. "tar," 1.5 mg. nicotine av. per cigarette, FTC Report Apr. 72

Warning: The Surgeon General Has Determined That
Cigarette Smoking Is Dangerous to Your Health.



Is this your last summer for a summer job?

Summer jobs between high school years are good-time jobs. A little work, a lot of laughs, and a few extra bucks when you head back to school in September.

But the summer job after graduation is your last summer job. And if you're not going on to college this fall, consider a job in today's Army.

A job that teaches you a skill and pays you as you learn. You start at \$288 a month. With free meals, housing, medical and dental care, and 30 days paid vacation each year.

It's a job that lets you live away from home and afford it. Not only in the States, but in places like Europe, Hawaii, Panama, and Alaska.

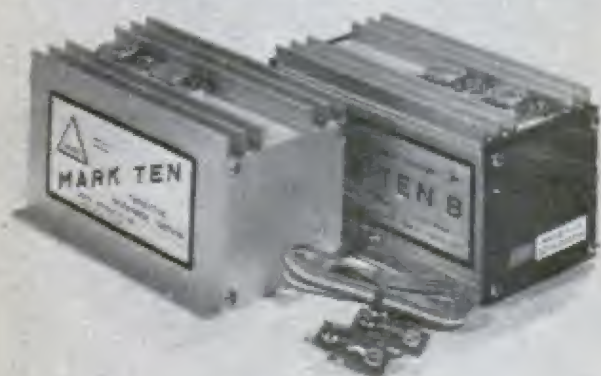
Finally, if after your 3-year enlistment you're interested in college, there's 36 months of financial assistance at the college of your choice.

If you'd like to know more about this unique combination of job-training, pay and benefits, see your Army Representative. Or send us the coupon.

**Today's Army
wants to join you.**

Army Opportunities		Date _____
Dept. 200, Hampton, Va. 23369		2PM 8-72
I'd like to know more about job-training and promotion in today's Army.		
Name _____	Date of birth _____	
Address _____		
City _____		County _____
State _____	Zip _____	Phone _____
Education _____		

Tune Out Tune Ups



Discover how a Delta Mark Ten or Mark Ten B Capacitive Discharge Ignition System on your car can eliminate 3 out of 4 tune ups. Write for complete information today.



DELTA PRODUCTS, INC.

P.O. BOX 1147 • GRAND JUNCTION, COLORADO 81501
PHONE: (303) 242-9000

Dept. PM

THE SCOTT ENGRAVER Your spare time money-maker

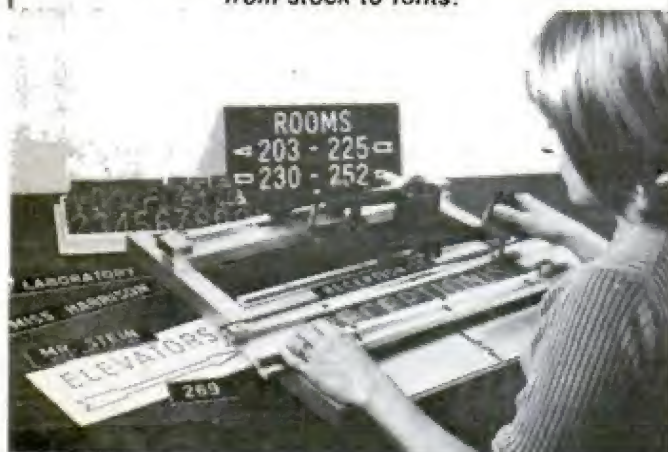
Scott's SM100 turns 10¢ worth of plastic laminate into a product you can sell for 75¢ to \$1.00. Every business is a prospect. Make name plates, signs, plaques and more . . . in just minutes, using just one hand. A complete, ready-to-operate engraving shop to help you make big money in your spare time!

To find out more, send for free catalog, today.
Dept. PM-72

SCOTT MACHINE DEVELOPMENT CORP.

P. O. Box 217
Walton, New York 13856

Scott fills every engraving need—
from stock to fonts.



DRIVIN' WITH DAN

(Continued from page 56)

should do is drive like a road racer, and do all your braking down before going into the turn. You might look at the drawings and techniques for driving through corners quickly in Bill Hartford's story, *How I Became A Racing Driver in 3 'Easy' Lessons*, page 86, Jan. '71 PM.

Q. Mark Donohue has gone NASCAR with his American Motors Matador. It seems like a Javelin would have the edge in aerodynamics, so why doesn't he drive one instead? Also, how do you think a compact station wagon would do in NASCAR races?—John Strain, Kingston, Tenn.

A. The Grand National rules preclude the use of the Javelin in the same way that they rule out the Mustang, Camaro, Firebird, Barracuda and so on. They run in the NASCAR Grand American series.

I doubt if the station wagon's aerodynamics would be as good as the normal sedan's. Too, there'd probably be a weight penalty and the center of gravity would be higher.

Q. I'm trying to improve my Dodge Colt's handling. Do you think helper springs would make the rear end track better, or should I add a stabilizer bar too?—Staff Sgt. K.W. Carpenter, APO San Francisco.

A. I'd go for the stabilizer bar as more helpful than the springs.

Q. What do you consider the greatest race you ever drove and why? I think it was the 1967 Rex Mays 300, where you came back from a flat tire to win.—Tommy Roper, San Bernardino, Calif.

A. Yes, that was a good one! But there were others that were as good or better from the standpoint of pure driving performance, even though I didn't win. There have been many drives that I have been very proud of—I find it impossible to pick just one.

Q. In NASCAR stock-car racing, is there anything in the rules against turbocharged engines? If so, why?—Ted Weydert, Maple Park, Ill.

A. Yes, because there are no "stock" cars offered to the public with turbocharged engines at the moment.

Q. How much cheating on rules goes on in the major racing circuits like USAC and NASCAR? Do many guys get caught?—Ted Skelton, Norfolk, Va.

A. There will always be a lot of "ingenuity"

(Please turn to page 60B)

POPULAR MECHANICS

Now! Do any car repair this quick, easy way

You can "breeze through" engine jobs, tune-ups, front end jobs, brake repairs, steering adjustments, carburetor adjustments, alternator servicing — almost ANY car service or repair job ON THE VERY FIRST TRY!



1 FIND THE TROUBLE!
MOTOR's AUTO REPAIR MANUAL features Trouble-Shooter Section and detailed trouble-shooting info thruout, to help you spot 4,200 car troubles and find the repair needed. No guesswork!



2 FIX THE TROUBLE!
Step-by-step instructions, photos, diagrams show you where to start, what tools to use. Factory experts practically guide your hands through every move. You can't go wrong!

OVER 1,000-PAGE ILLUSTRATED GUIDE SHOWS YOU

How to Fix Almost Any Part of Almost Any Car

YES! MOTOR's giant new **AUTO REPAIR MANUAL** is the answer to practically all your car repair problems. Almost every car repair on popular-make cars built since 1966 is explained and illustrated in fool-proof detail. You will develop new speed and confidence on any repair job you tackle.

Try it FREE for 10 Days

Words can't possibly describe the vast contents... the thousands of photos and diagrams... the easy-to-see instructions... the wonderful feeling when you know you've got that car running like new again!

You've got to see it, use it for yourself! That's why we offer to send it to you, at our risk, for **FREE** ten-day trial. Try it. See how it makes even the toughest jobs seem like child's play. If you're not 100% satisfied, just send it back and you won't owe a penny!

Same Offer on MOTOR's AUTO ENGINES & ELECTRICAL SYSTEMS
1,300 pics, how-to text on principles; design, upkeep of engine & electrical systems. Check box in coupon.

Almost Everything You Need to Know to Fix Cars Like a Crack Mechanic
The instructions and pictures are so complete, so clear, you just can't go wrong. Your hands

are guided by the men who actually build the cars, for this book "boils down" the time-cutting and work-saving methods from 300 official factory shop manuals.

This **NEW, REVISED EDITION** gives you just about everything you need to know to service or repair engines, transmissions, brakes, ignition systems, automatic level controls, exhaust emission controls, speed controls, carburetors, fuel pumps, universals, steering, alternators, etc., etc. — practically every part of the car makes listed below.

Over 1,000 double-size pages include more than 3,000 pictures, 300 Quick-Check charts, 55,000 essential specifications — more than 225,000 service and repair facts! It includes all the new 1972 models.

No wonder you'll see copies of MOTOR's Manual on almost every garage workbench in the country. No wonder it's used by schools, factories, the U.S. Army & Navy. Over 6,000,000 copies sold.

SEND NO MONEY

Just mail the coupon. Use the Manual for 10 whole days **FREE**. If it doesn't pay for itself in time and money saved within 10 days, return it and owe nothing. But act now! **MOTOR BOOK DEPT., P.O. Box 2316, F.D.R. Station, New York, N. Y. 10022.** (Schools Bookstores: Write for Discounts.)

FIX ALL THESE CARS

Volkswagen
Mustang
Barracuda
Chevy II
Pontiac
Thunderbird
Buick
Imperial
Cadillac
Continental

Mercury
Ford
Chevelle
Chevrolet
Vega
Chrysler
Plymouth
Oldsmobile
Rambler
Dodge

Mark III
Buick
Special
Comet
Corvair
American
Olds F-85
Falcon
Fairlane
Tempest
Corvette

Cougar
Tornado
Valiant
Dart
Javelin
Montage
AMX
Pinto
Hornet
Maverick
... and more!

FREE 10-DAY TRIAL

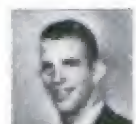
Return and Pay Nothing If Not Satisfied

MOTOR's AUTO REPAIR MANUAL

Nearly 1 FOOT HIGH
Over 3,000 Illustrations
Over 1,000 Pages

OVER 6,000,000 COPIES SOLD

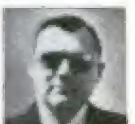
PRaised BY BEGINNER AND EXPERT MECHANICS ALIKE...



"I am a racing 'bug' and expect the most out of my cars. Your Manual has been of excellent help to me." — **Duane Davis, Indiana** (Racing Advisor)



"I always rely on my Motor Books. They're well illustrated — and complete and simple." — **Mr. Erv Jones, Minnesota** (Garage Owner)



"Motor's Auto Repair Manual is invaluable to me. I depend on it for all makes and models." — **Mr. W. W. Farlines, Virginia** (Mechanic)

MOTOR BOOK DEPT.

P.O. Box 2316, F.D.R. Station, N.Y., N.Y. 10022

Please send me the Manuals checked below for ten days free examination:

- ☐ 11122 MOTOR's Auto Repair Manual, \$10.95
☐ 12526 MOTOR's Auto Engines & Electrical Systems, \$10.95

If I am not fully satisfied, I will return the shipment promptly and owe nothing. Or I will keep it and pay the total price in three monthly installments, plus a small shipping charge.

I WANT TO SAVE SHIPPING CHARGES

☐ I am enclosing payment of \$..... in full and you will pay shipping charges. (Same return privilege, refund guaranteed.)

Print Name.....

Address.....

City & State..... Zip.....

Signature Please..... Age.....

Prices slightly higher in Canada. Offer available only in continental United States. Delivery will normally be within 3-4 weeks in Eastern U.S. Please allow longer west of the Mississippi.

(M.M. Books)

Free Fireplace Idea Kit



Colorful catalogs full of ideas on Heatilator factory-built fireplaces you can install yourself in any room, on and against combustible materials—no masonry foundation needed. And you can decorate any way you wish. Includes built-in, wall-hung and free-standing fireplaces—wood or gas fireplacing simplified! Also available in Canada.

heatilator®
AMERICA'S LEADING FIREPLACE SYSTEMS

—Send for FREE FIREPLACE IDEA KIT—

Heatilator Fireplace
A Division of Vega Industries, Inc.
3082 W. Saunders St.
Mt. Pleasant, Iowa 52641

Name _____

Address _____

City _____ State _____ Zip _____

**Degreasing mowers
and blowers
a problem?**



**We've
got
the
product...**



AVAILABLE WHERE PAINT IS SOLD

SAVOGRAN

Norwood, Massachusetts 02062

DRIVIN' WITH DAN

(Continued from page 60)

used in a racing effort. There are some gray areas in the rules that are very hard to define, and racers will constantly be probing the strength of the rules. Not many teams get caught. There are very few blatant cheaters, but many innovators!

Q. I'm writing a term paper on stock-car racing and wonder how you evaluate that type of racing?—Billy House, Huntsville, Ala.

A. It is very competitive, very specialized, governed by many rules with restrictions which limit design horizons, but on the whole it is certainly real exciting racing, paying a lot of real money. And, as you know, stock-car racing is the most popular spectator sport in the Southeast.

Q. At the California 500 in 1971, Mark Donohue ran out of gas. Do the cars have gas gauges? If so, what happened to Mark's?—Chuck Barrett, San Marino, Calif.

A. No, they do not have gas gauges. They are not used in racing cars because the shape of the tanks does not lend itself to the normal gauge-actuating mechanism. Actually, it seems to me that it would be a big advantage to have a reliable gauge. I shall try to incorporate one. Why, that would be a new invention in racing! Progress! In Donohue's case, I'd say that the dry tank was a mistake on the part of Roger Penske's pit crew, but of course hindsight vision is always 20-20.

Q. I'm really starting to get worried about the government taking all the fun out of cars. Couldn't you organize a movement to keep it from happening? Or do you agree with me?—B. A. Saltzman, Greensboro, N.C.

A. I think you are right. Driving should be fun. A good handling car that is light and nimble is also safer because it can avoid accidents rather than survive them. I think we shall see a trend towards smaller, more agile cars which will pollute less by getting more mpg, and be more responsive. As to organizing a movement, I'm ready with my opinions, but otherwise all of my time will be devoted to surviving in this rough racing business! ★★★

If you have questions on racing, high-performance and everyday driving techniques, send them to "Drivin' with Dan," c/o Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Questions cannot be answered by individual letters. Questions on maintenance and repair should be addressed to the Auto Clinic (see page 46).

You get more for your money from NRI



BUILD • TEST • EXPLORE All this is yours — from Achievement Kit, to solid state Radio, to training-engineered Color TV set—when you enroll for NRI's TV-Radio Servicing course. Other courses equally complete. Unique training methods, "bite-size" texts, many personal services have made NRI the leader in its field for over 50 years.

NRI Programmed Equipment Gives You Priceless Confidence, Makes Learning TV-Radio, Electronics Fast and Fascinating

NRI pioneered the idea of supplying home-study students with custom designed training kits to give practical on-the-job experience as you learn. Today, NRI's "3-Dimensional" training can't be equalled. You get more value—from the exclusive Achievement Kit sent the day you enroll, to "bite-size" texts and custom training equipment. Learning TV-Radio, Electronics or Communications at home is easy, exciting, the NRI simplified, dramatized way.

BE A SKILLED TECHNICIAN IN AMERICA'S FASTEST GROWING INDUSTRY

Regardless of your educational background, you can learn the Electronics field of your choice the practical NRI way. The NRI color catalog, sent to you free and without obligation, tells you how you can qualify quickly to be a part of the fast growing Electronic Age; about engineering jobs in business, industry, broadcasting, government, now offered to men without college degrees. It will open your eyes to the great number of success opportunities available right now in the high-pay world of TV-Radio Servicing, Broadcasting-Communications and Industrial-Military Electronics. With NRI technical training, you can take your choice of a wide variety of career

openings or have a business of your own. And if you choose one of five NRI courses that include FCC License preparation, you must earn your FCC License or NRI refunds your tuition!

MAKE \$5 TO \$7 AN HOUR EXTRA IN SPARE TIME STARTING SOON

Tens of thousands of NRI graduates are proof it is practical to train at home in your spare time. Keep your present job while preparing for a better one, and earn \$5 to \$7 an hour extra in spare time while you train, fixing sets for friends and neighbors. NRI shows you how. Equipment you build and keep becomes useful in your work.

STEP UP TO BETTER PAY, A BRIGHTER FUTURE

NRI can help you, but the decision to act must come from you. Decide now to move ahead . . . mail the postage-free card today for your FREE NRI color catalog. No obligation. No salesman will call. NATIONAL RADIO INSTITUTE, Electronics Division, Washington, D.C. 20016.

APPROVED UNDER GI BILL

If you served since January 31, 1955, or are in service, check GI line on postage-free card or in coupon.

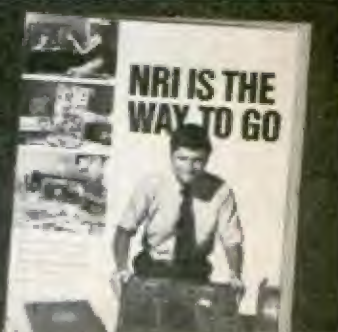
CASH IN ON THE BOOM IN COLOR TELEVISION



The NRI TV-Radio Servicing course includes your choice of black and white or color TV training equipment. Color TV needs thousands of trained men to keep pace with millions of sets being sold every year. NRI prepares you quickly. Cash in on the boom.

Mail insert card for
**your FREE NRI
color CATALOG**

No salesman will call



HOMEOWNERS' CLINIC

BY W. CLYDE LAMMEY

Painting new plaster

How long a time should elapse before new plaster (not Spackle) is painted?—J. Horner, Knoxville, Tenn.

New plaster contains moisture which should be allowed to dry out before you paint. Offhand, I'd set 90 days' drying time as a minimum unless the room is heated for part of the drying period. In that case, the time could be shortened to two months.

Tree roots heave sidewalk

Exposed roots from a tree are breaking up the walk in front of my house. Can they be cut away without damaging the tree?—Robert Langley, Little Rock, Ark.

If these are brace roots—and undoubtedly they are if as described—such cutting may expose the tree to infection or insect invasion and weaken its resistance to windstorms. It would be better to remove the damaged walk and relay it, curving it around the exposed roots. This should permit the tree to reach maturity without further damage to the walk.

Cleaning basement floor

My concrete basement floor is dirty—I mean ground-in dirt. Detergents, household bleach or scrubbing just don't clean it. I want it cleaned to the original color. Any suggestion?—E. Roth, Cleveland.

Yes, that you forget it and resort to painting. Ground-in dirt is difficult to remove from concrete. Clean the floor by scrubbing, allow it to dry, then etch with a prepared (paint-store) solution and apply a coat of paint that's approved for use on concrete floors.

Musty books

I keep books in my rec room in a sectional bookcase. When I had to remove them recently, I noticed a musty odor. They seemed to feel damp and in some the edges of the pages were curled. Is there a cure for this condition?—Leo Buss, Gainesville, Fla.

The simplest cure is to air the books outdoors under bright sunshine for several

hours, then operate an automatic dehumidifier to reduce moisture of the room air. While you're at it, air the bookcase sections in the sun along with the books.

Tacky varnish stain

My stair rail was getting worn through, almost to the bare wood, so I used a varnish stain. This didn't dry; it's still sticky to touch. Why?—W.L. Savery, Providence, R.I.

Very likely the rail has been "oiled" for some years by hand and fingerprints which you didn't wipe off with a solvent before you applied the varnish. It's also possible the varnish was too old—far past its allotted "shelf life."

Clear off the sticky mess with a varnish remover of the wash-off type, then sand the area smooth and try again. After this treatment the coating will dry if you give it the required drying time.

'Longer look' with narrow siding

I live in a small ranch house that is sided with wide boards. I'd like to make it appear longer and lower. Can such an illusion be created?—L. Powers, Little Rock, Ark.

In some settings and depending a bit on the architectural detail, a darker-colored paint will give the effect of greater length.

For a better way, apply narrower siding, such as 4-inch widths over the existing 8-inch boards. There are also 8-inch-wide sidings to be applied in such a way that you end up with the appearance of 4-inch siding.

Stain painted shingles?

Shingled walls of my house are painted. Can I use a stain on them?—R. Blanchard, Portland, Me.

No. Stains commonly used on shingles won't "take." You risk flaking of the stain and peeling of the paint. Some homeowners use a chalking paint on previously painted shingles. This gives a rather flat surface similar to stains in appearance, but it has a tendency to run as it chalks, thus discoloring different-colored window trim.

★★★

Do you have a home maintenance or repair problem? Send it to Homeowners' Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. While letters cannot be answered individually, problems of wide interest will be discussed in this column.

If your menthol doesn't make it,
make your menthol KOOL.

Come all the way up to KOOL.
The only one with the taste of extra coolness.



Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health

18 mg. "tar," 1.4 mg. nicotine
av. per cigarette, FTC Report Aug. 71.

Manufactured by B&W Tobacco Company, Louisville, KY 40201



Seagram's 7 Crown. It's America's whiskey.



America's a big country.

A country where it's hard to please everyone.

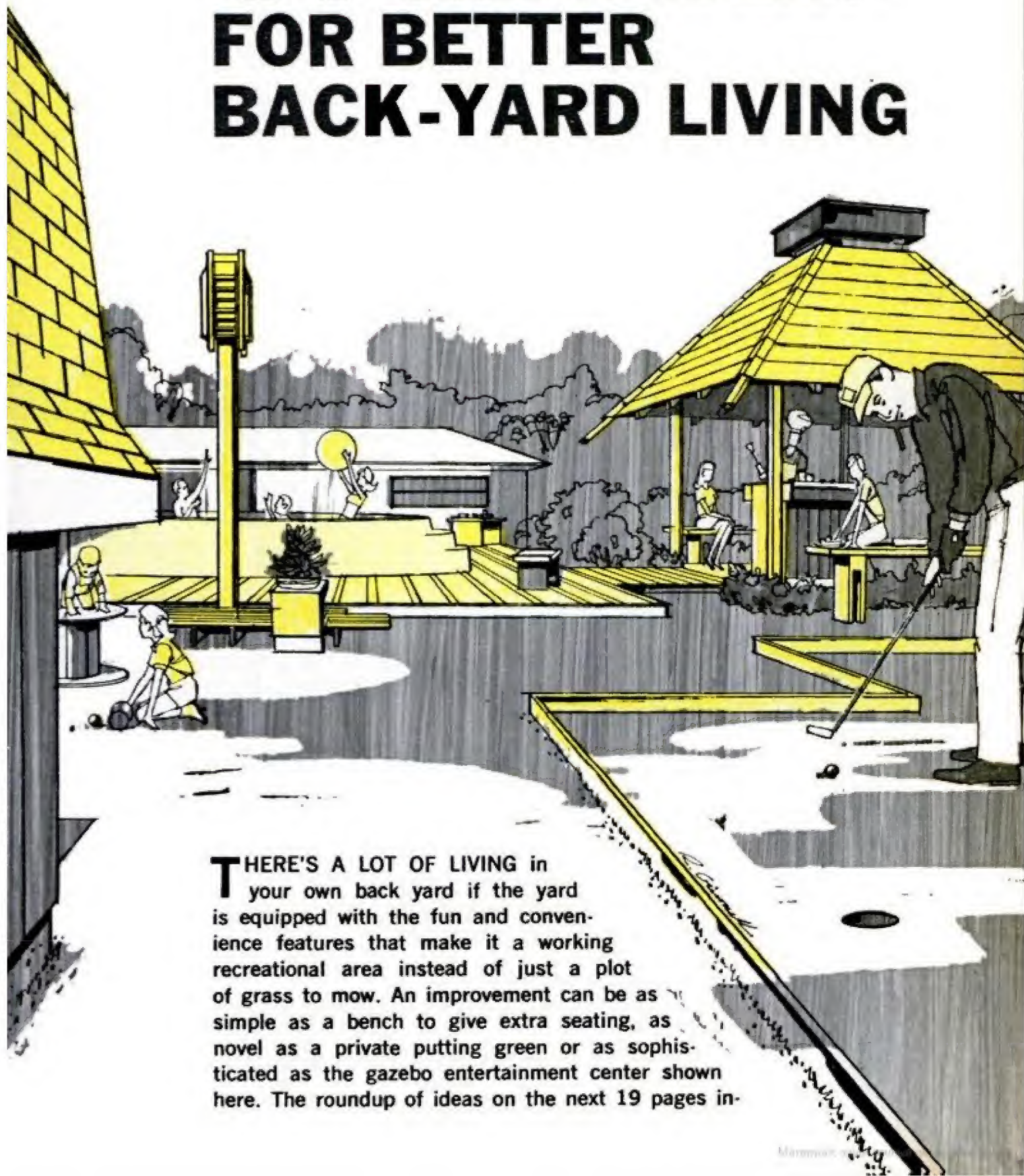
But there's a whiskey that comes pretty close. Seagram's 7 Crown. Year after year 7 Crown outsells every other brand. Of any kind. And emerges clearly as America's favorite whiskey.

Taste 7 Crown. And see for yourself why it's so popular.



SEAGRAM DISTILLERS CO., N.Y.C.
BLENDED WHISKEY. 86 PROOF. 65% GRAIN NEUTRAL SPIRITS.

15 GREAT IDEAS FOR BETTER BACK-YARD LIVING



THERE'S A LOT OF LIVING in your own back yard if the yard is equipped with the fun and convenience features that make it a working recreational area instead of just a plot of grass to mow. An improvement can be as simple as a bench to give extra seating, as novel as a private putting green or as sophisticated as the gazebo entertainment center shown here. The roundup of ideas on the next 19 pages in-





cludes these and 12 other practical, eye-pleasing projects that would be welcome in any yard.

Obviously, few properties are large enough to include all of the improvements shown in the "dream yard" at left. Regardless of the number of improvements you decide to add, any of the ideas shown can be installed professionally or handled alone by a do-it-yourselfer. Any one of them will make for better outdoor living.

There are certain points to keep in mind. Depending on locale, for example, permits might be required for certain structures. Thus, before you take on the gazebo or swimming pool, check your local building code. Fencing is often regulated in design, as well as height and proximity to property lines. Frequently an elevated deck requires installation of a minimum-height railing. To save yourself cash and aggravation, after planning your project check with your building department to assure conformance with local codes.

Some products are better than others for particular jobs. Because of its resistance to rot and termites, redwood is best for decking and fence panels. Yet, for fence posts, cedar will last longest. You'll find all this information along with the good ideas listed below.

LEGEND

	Page
1. Dutch mini-barn	64
2. Synthetic putting green	66
3. Gazebo	70
4. Conversation corners	70
5. Patio cart	71
6. Pool and deck carpeting	71
7. Fancy fences	72
8. Patio planters	75
9. Redwood benches	75
10. Fence-niche planter	76
11. Rock-garden foot bridge	76
12. Handsome yard light	77
13. Playground equipment	78
14. Fiberglass swimming pool	80
15. Prefab decking modules	80

1

Dutch mini-barn

THOUGH the roof design of this little lawn building, designed and built by Martin A. Chomoa, Bay Village, Ohio, is actually somewhere between gambrel and mansard, we've labeled the structure "Dutch" because it reminds us of Dutch colonial architecture. Happily, because of the roof, construction cost is low—the barn shown here was erected for approximately \$397, including the slab and footings.

The sloped roof has a 3-in-12 pitch. In

many localities, a 6-in-12 pitch is required; this slope would result in a more conventional gambrel roof. The building boasts 8-ft. headroom inside. Thus, there is more than enough storage room for bicycles, lawn furniture, garden tools and flammable items such as turpentine, fuels and the like which are best stored away from your residence.

Complete plans are available so that you can start work on the barn as soon as you receive the plans. How-to-order information is given on the facing page.

Materials selected for exterior use were based on practicality as well as economy. The textured cedar siding, for example, is simply stained and left to weather. The



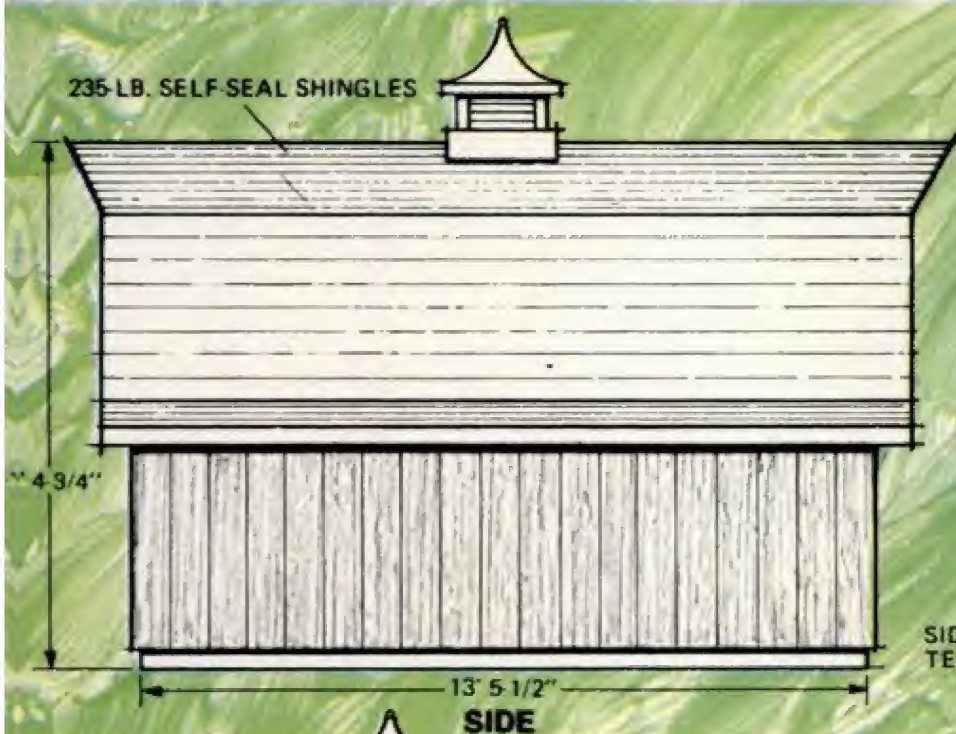
doors and fixed-windows are made on the job. There is adequate ventilation when the barn doors are open because of the cupola.

If you plan to use the barn as a yard "office," workshop or potting shed, you are well advised to install conventional windows to assure sufficient ventilation (and to satisfy building codes for occupied structures). If the barn is for storage only, the interior walls are left unfinished.

The barn rests on a slab which, in turn, is supported by a foundation wall around the perimeter. The latter can be either poured or cement blocks on footings, but regardless of type, the footings should be below the area frostline to avoid chance of frost upheaval.



ROOMY LAWN BUILDING easily corrals bikes, garden equipment and the like, can be built for about \$400



TO ORDER PLANS

For one complete set of construction plans, materials list and a construction guide, send \$3.95 to Popular Mechanics, Dept. DM, Box 1014, Radio City, N.Y. 10019. For two sets of plans—your building department may require one—send \$5.95. Allow three weeks for delivery.





Putting green

IF YOU'D RATHER spend Saturdays swinging a putter instead of a grass whip, Lawnscape Landscaping is the material that can make your dreams come true. The decorative "carpet" has a fiber facing that closely resembles living grass both in appearance and feel. The beauty of it is that once it is installed, there's no maintenance.

Made of a second-generation polypropylene that is polymerized to withstand aging and the weathering of extreme outdoor conditions, Lawnscape is a product of the Ozite Corp., 1755 Butterfield Rd., Libertyville, Ill. 60048. The synthetic turf is sold nationally through carpet dealers and building-supply centers at about \$6.95 per square yard. The same dealers also stock installation materials.

The material can be installed professionally or by a do-it-yourselfer. Since the carpet comes in 6 and 12-ft. widths, the putting

greens shown here are designed to utilize those modules.

The dirt or soil subsurface of the area to be covered should be shaped and well tamped. The manufacturer recommends either 1½ in. of asphalt or concrete over the compacted base for the Lawnscape to adhere to. (This minimum thickness will vary with load requirements.) Installation directly over earth is not recommended.

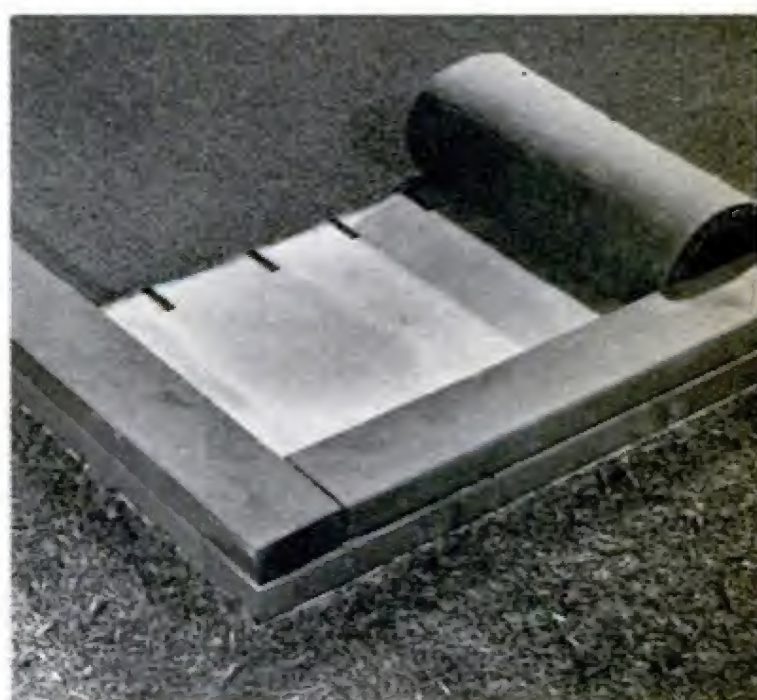
The surface finish should be as smooth and nonporous as possible. Because of the latter requirement, the covered area should be pitched slightly to direct water runoff where you want it to go.

The perimeter boards (headers) can be installed as shown in the drawings (page 68) or as in the photos below. The latter method creates shiplap joints by doubling up two-bys. Start by installing the headers because these can also be used for screeding the concrete. Once they are in and secured by stakes, the earth inside can be excavated and tamped. Then the concrete is laid up to the solid header and maintained

◀ IF HE MISSES PUTT, golfer (left) can't blame it on a poorly maintained green. The Ozite synthetic turf has the look and feel of grass and blends in beautifully when surrounded by the real thing (inset)



USE NOTCHED TROWEL to spread adhesive on area of exposed widths. When almost dry, turf goes down
AUGUST 1972



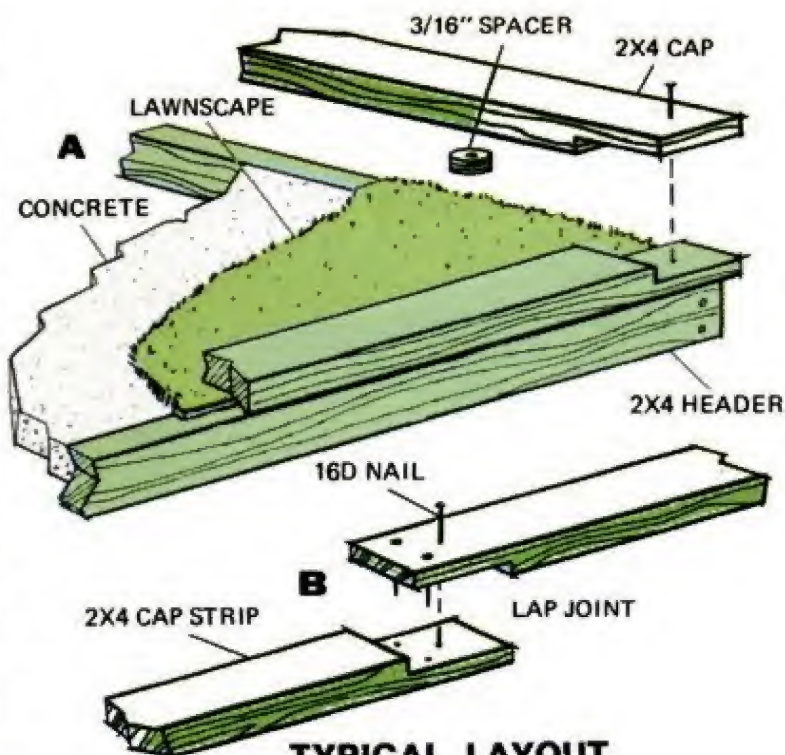
FOR INVISIBLE SEAMS, Seaming Pin-Tape is pressed into adhesive; the turf is then held by the barbs

approximately $\frac{3}{8}$ to $\frac{1}{2}$ in. below the header's top edge. This measurement should be as consistent as possible to maintain a uniform grass height. You can achieve it by using a notched screed on the header boards to level the concrete. If you use asphalt instead of concrete, seal the surface and allow it to dry overnight before installing Lawnscape.

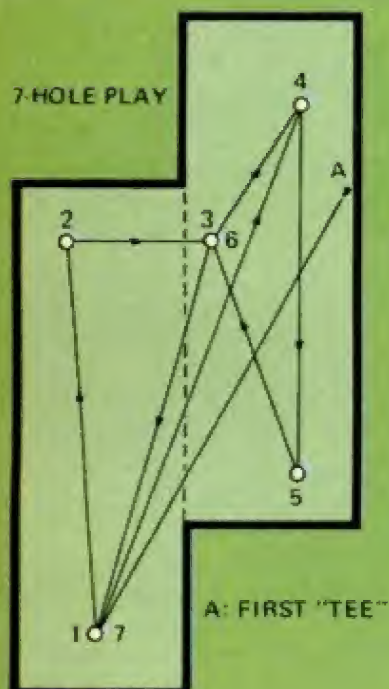
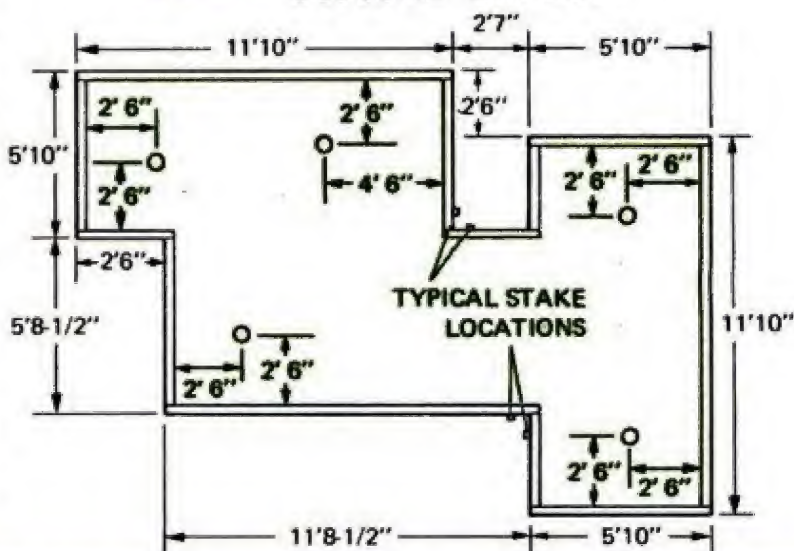
Sweep the surface clean and patch any irregularities. Spread the synthetic turf in the sun to warm it and trim edges to be butted. Then, using a $\frac{3}{32}$ -in. notched trowel, spread Ozite AP 770 adhesive over the area of exposed width. When the adhesive barely transfers to your finger (10 to 20 minutes), the turf can be rolled onto the surface. You can assure invisible seams with Ozite's Seaming System Pin Tape (see photos, page 67). These are positioned astraddle the edge. The grass is simply tapped into place with a hammer.

Lawnscape and related material—flags, cups and instructions—come as a kit. Simply select the layout you want and order that amount of carpeting in the kit.

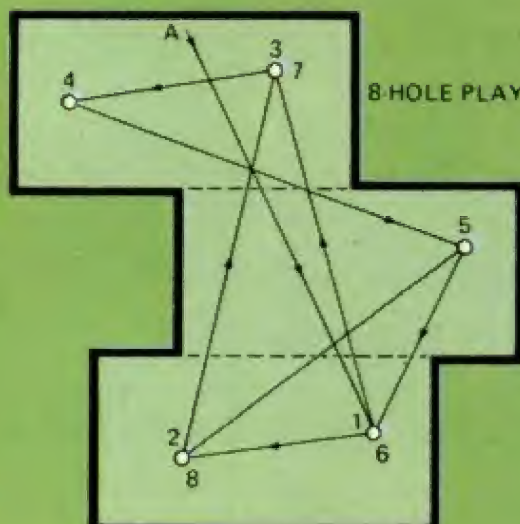
In addition to a putting green, you might want to consider the synthetic turf for swimming-pool aprons, patios, roof decks and the like.

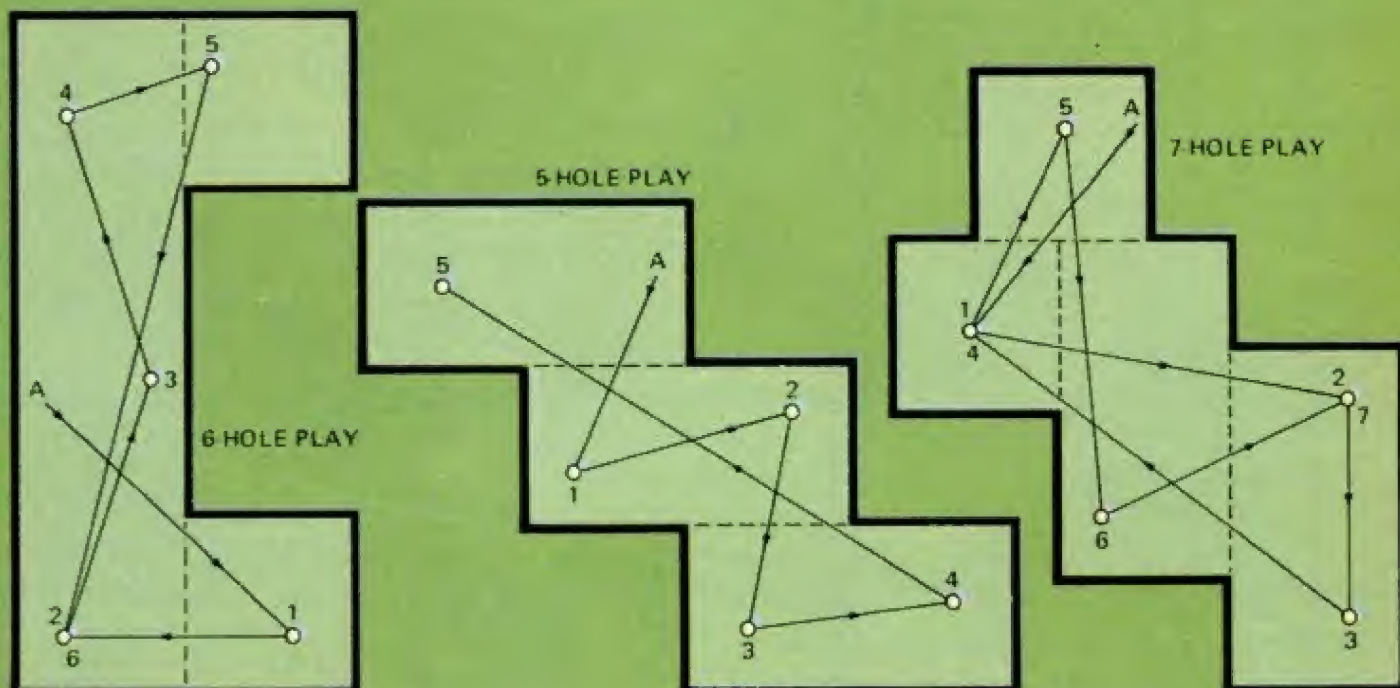
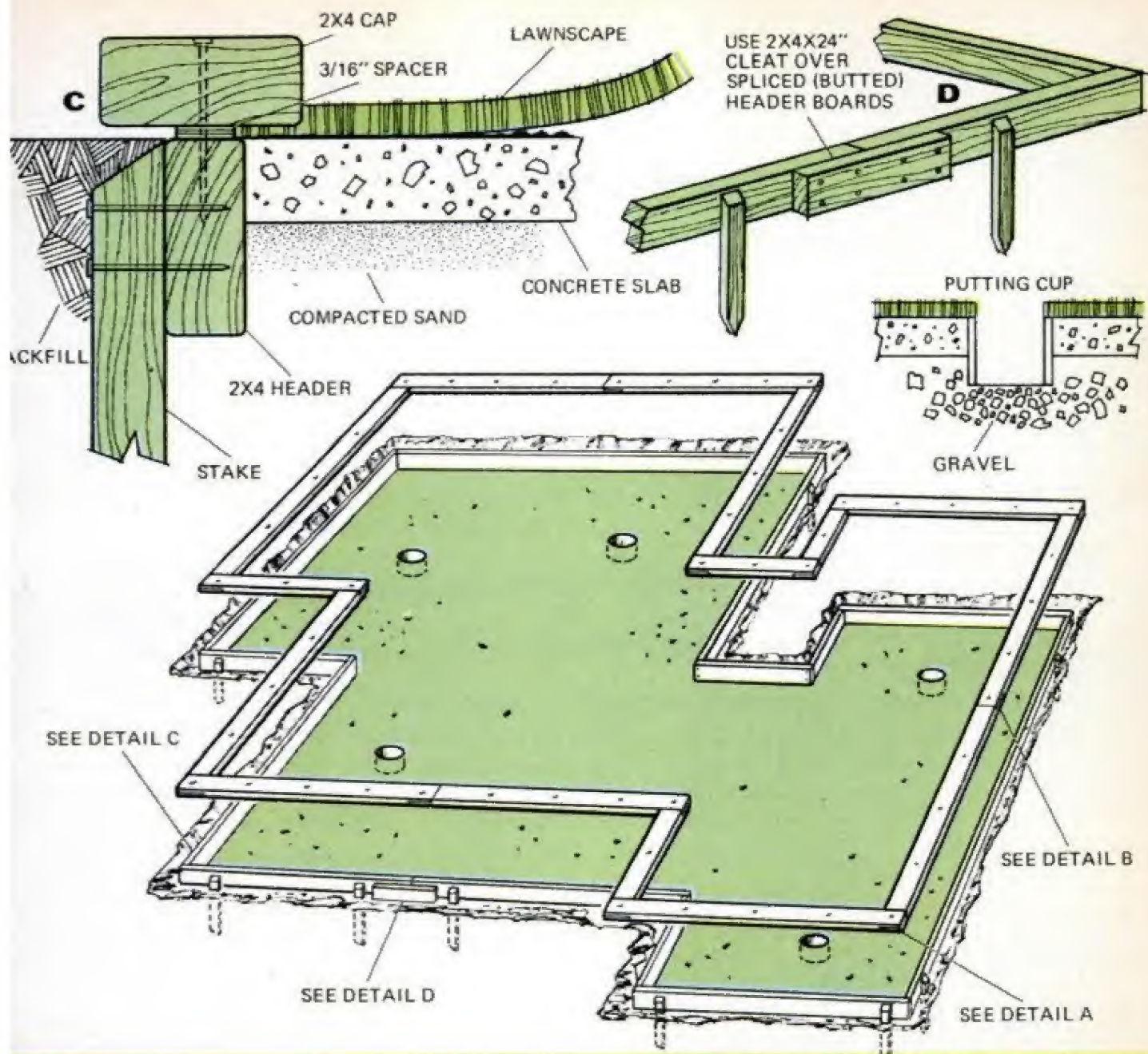


TYPICAL LAYOUT



ALTERNATE LAYOUTS







3 Gazebo

POPULAR as presented in *PM* in March 1970, this Cookout Gazebo enhances any back yard. The design, by Western Wood Products Assn., was adapted (and simplified) by *PM*. To order Xerox copies of the article, send \$1.20 to *Popular Mechanics*, Box 1014, Dept. HW, Radio City, N.Y. 10019.

Conversation corners

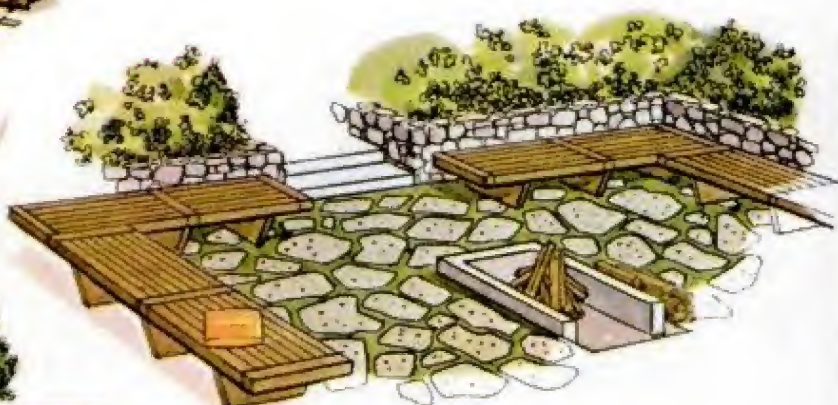
IN ORDER to turn your patio into a real outdoor living room, you will want to incorporate into its design an inviting area for just sitting and talking. In addition to comfortable seats, be sure to provide good lighting and privacy.

4



CORNER CREATED where a wing or garage meets the house is fine for a conversation center; walls may offer afternoon shade and privacy

CONVERSATION PIT can easily be built by terracing a slope. Retaining walls lend intimacy; fire pit is center of interest



PRIVACY FENCE and bench seating arrangement is ideal for groups of six to eight people. Coach lamps on fence and a fountain add charm

5

Patio cart

WITH this cart on your patio, you're no more the frantic host who must dash back and forth between kitchen and outdoors to prepare food and mix drinks. Everything you need is right at hand. The cart, originally shown in the August '71 issue of *PM*, is designed so that you can carry out electric appliances to the patio and plug them in. And beneath its hinged chopping block is a beverage-chilling, Styrofoam chest to store cold drinks. For Xerox copies of the original article (including the plans) send 80 cents to *Popular Mechanics*, Box 1014, Dept. HW, Radio City, N.Y. 10019.



6

Pool and deck carpet

ADD a colorful new pool, deck or patio covering with Ozite's Sunnyside Up outdoor carpet. It can be put on virtually any surface. For the nearest dealer, write to Ozite Corp., 1755 Butterfield Road, Libertyville, Ill. 60048.





SOAK UNTREATED POSTS in creosote before setting. The treated portion of post should extend at least 6 in. above the grade mark. Use creosote with caution

Fancy fences

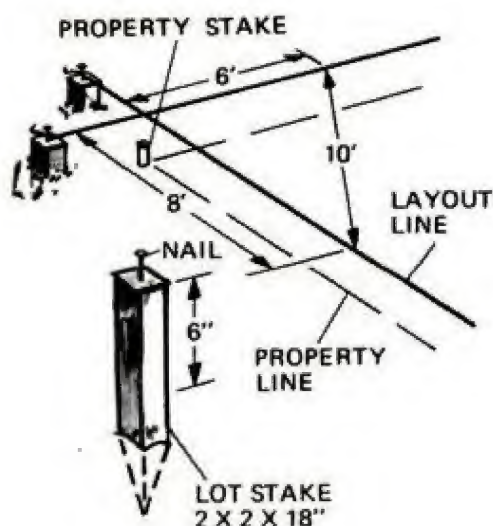
7

WHATEVER the truth of the old saying, "Good fences make good neighbors," there are at least four other reasons for building a fence when you improve your back yard. Good looks is one reason of course, but fences can also be laid out to direct yard traffic, to serve as parts of conversation areas or as part of a total concept in patio-planter-bench treatments.

The fence designs shown on these pages were created by the West Coast Lumbermen's Assn., 1410 S.W. Morrison, Portland, Ore.

Rule one when picking a fence for your yard is to

YARD STRUCTURES, pruning, planting, or anything in the garden: Get expert help from PM's new Complete Gardening Guide, a set of 24 plastic-laminated, information-packed reference sheets. Send \$3.95 to Popular Mechanics, Dept. GG, Box 1014, Radio City, N.Y. 10019.



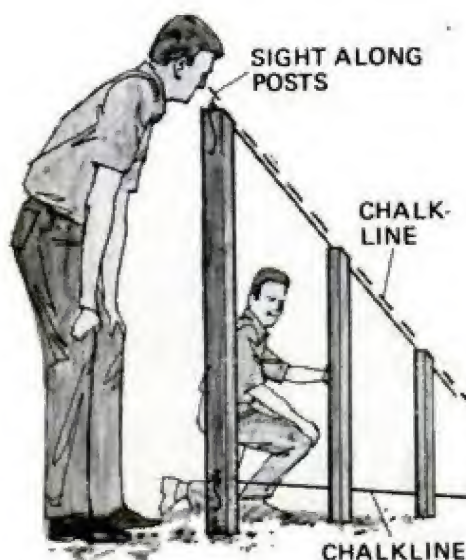
make certain that it blends with both the architecture of your home and the look of the land.

Another good point to keep in mind is that once you have painted a fence, you have imposed upon yourself a periodic repainting chore. Thus, it makes good sense to use stain whenever possible and let

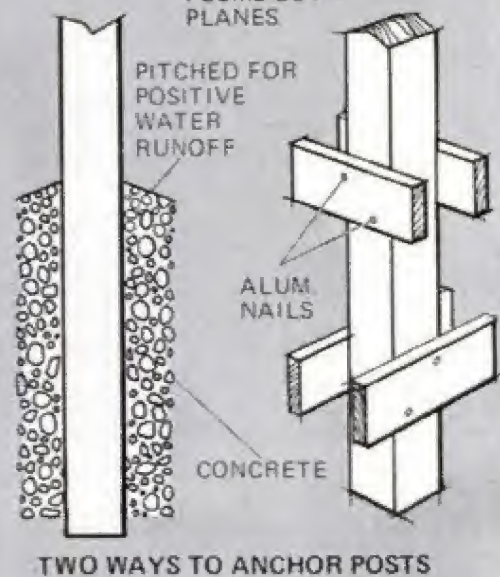
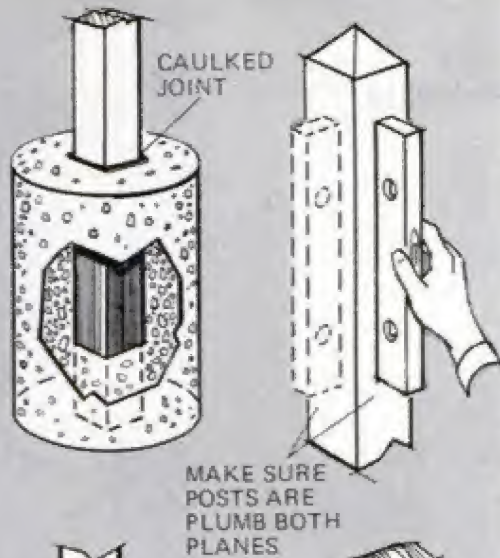
WELL-PLANNED FENCE lets through uninterrupted flow of air for greater warm-weather comfort. Notice careful landscaping

California Redwood Assn. photo

WAYS OF LOCATING fence and of aligning posts are shown above and below. Careful attention to detail (following grade for example) makes a professional-looking job

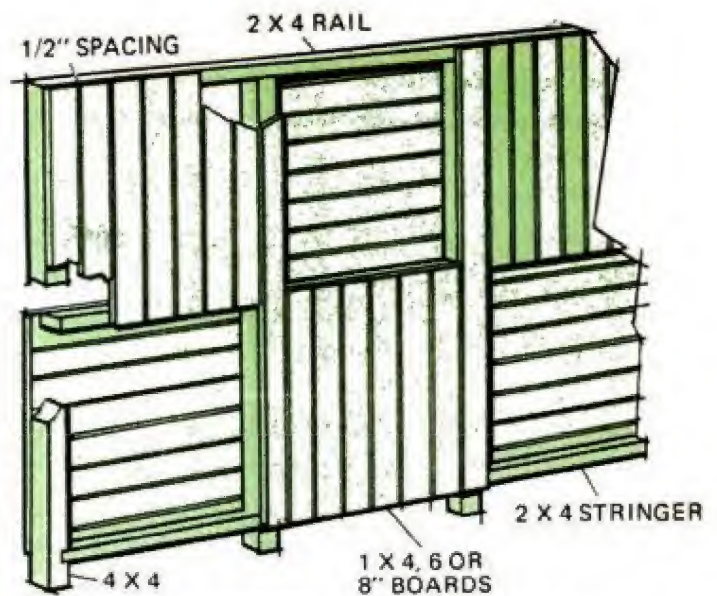


HOW TO SET POSTS

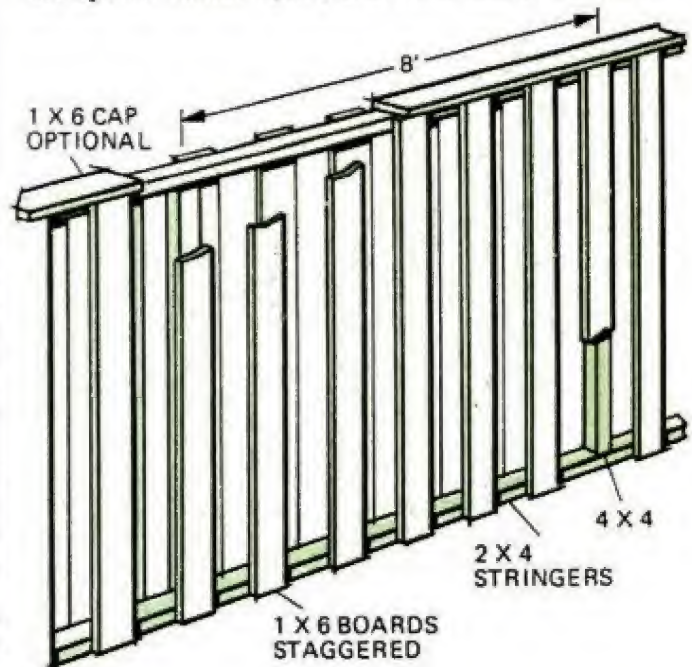


TWO WAYS TO ANCHOR POSTS

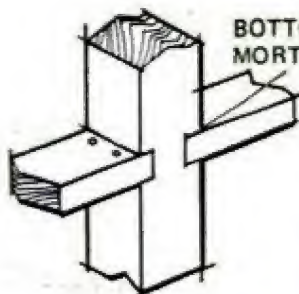
PLANTING 4x4 POSTS is first step in any fence installation. Rail and post details are shown below



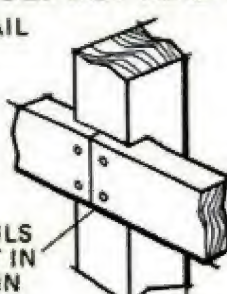
CHECKERBOARD DESIGN above has narrow spacing between boards. Staggered boards in fence below are spaced farther apart, and fence can sit on patio



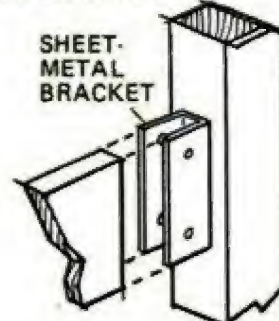
FENCEPOST AND RAIL DETAILS



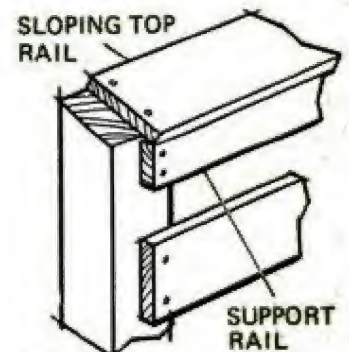
BOTTOM RAIL MORTISED



RAILS SET IN GAIN

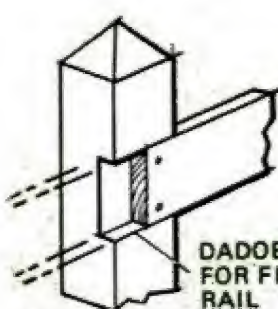


SHEET-METAL BRACKET



SLOPING TOP RAIL

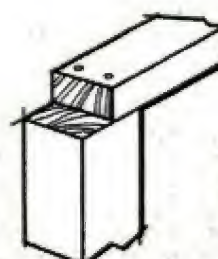
SUPPORT RAIL



DADOED FOR FLUSH RAIL



RAILS TOE-NAILED TO POSTS



TOP RAILS NAILED TO TOPS OF POSTS

CORNER POST

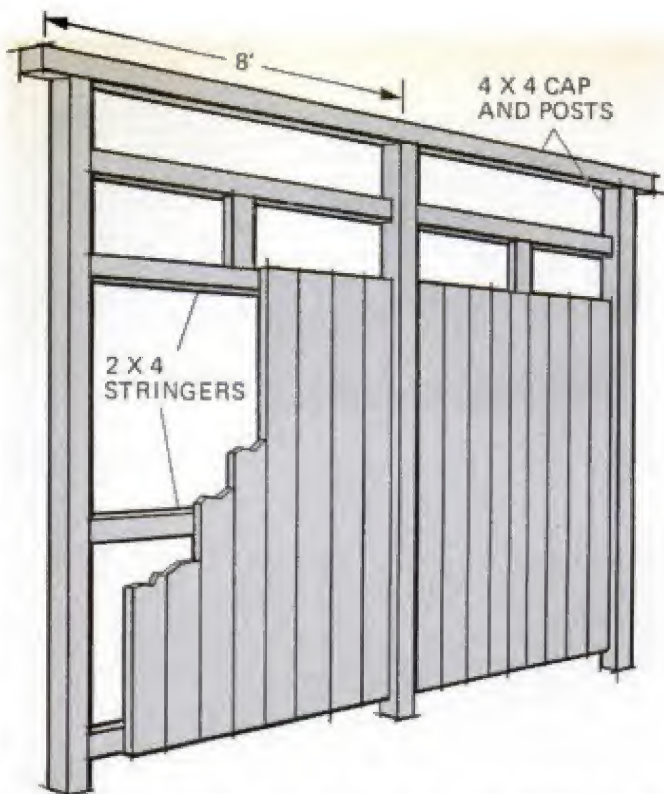
MITERED

the boards age by exposure. A stained, natural fence blends with all types of architecture and the weathered patina adds to the wood's charm.

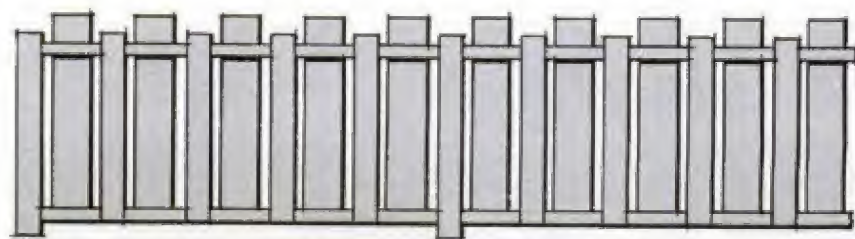
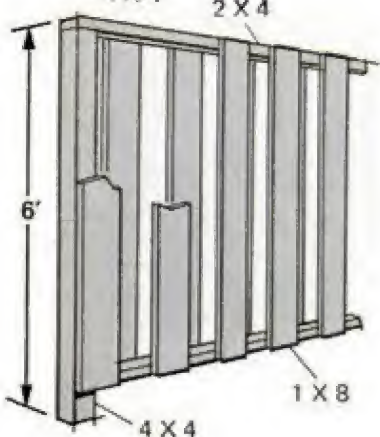
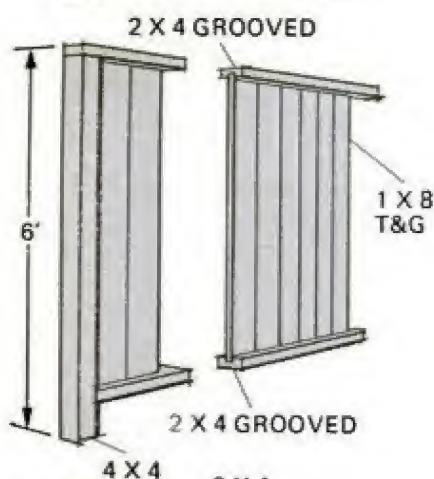
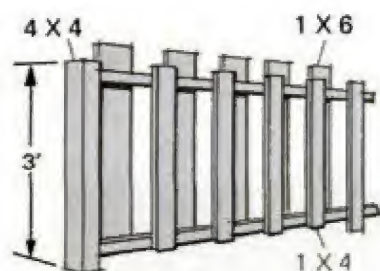
Almost any wood can be used for the in-the-earth posts, but cedar is generally accepted as the best choice. It is not expensive and will last the longest when embedded in soil.

Posts can be placed in a concrete collar as shown or simply surrounded by tamped earth. If you use concrete, make certain that each post runs through the footing. Otherwise, water draining *through* the post will be trapped below and the rotting process will be accelerated.

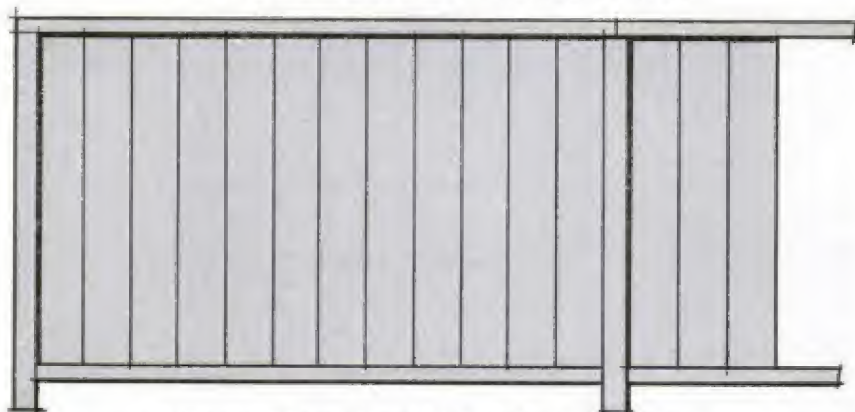
Redwood and pine are the woods usually preferred for above-ground use—the first because of its longevity when exposed to weather and the second because of low price. ★★★



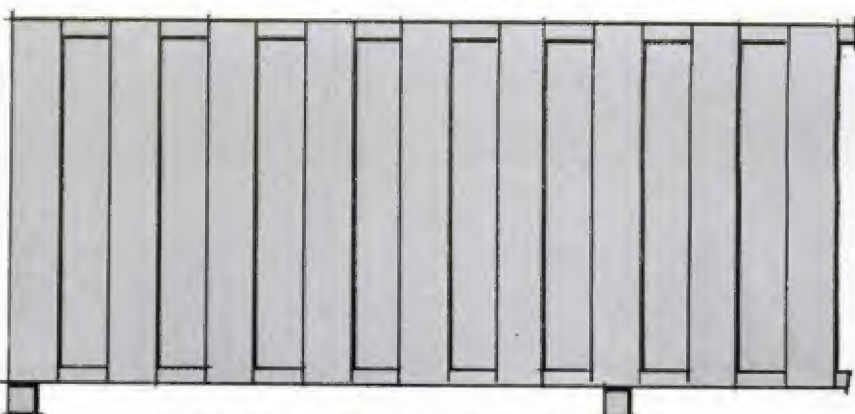
SOLID PRIVACY SCREEN is suited to large yards. Decorative horizontal members above panels are ideal for hanging plants, ivy or ornamental lanterns



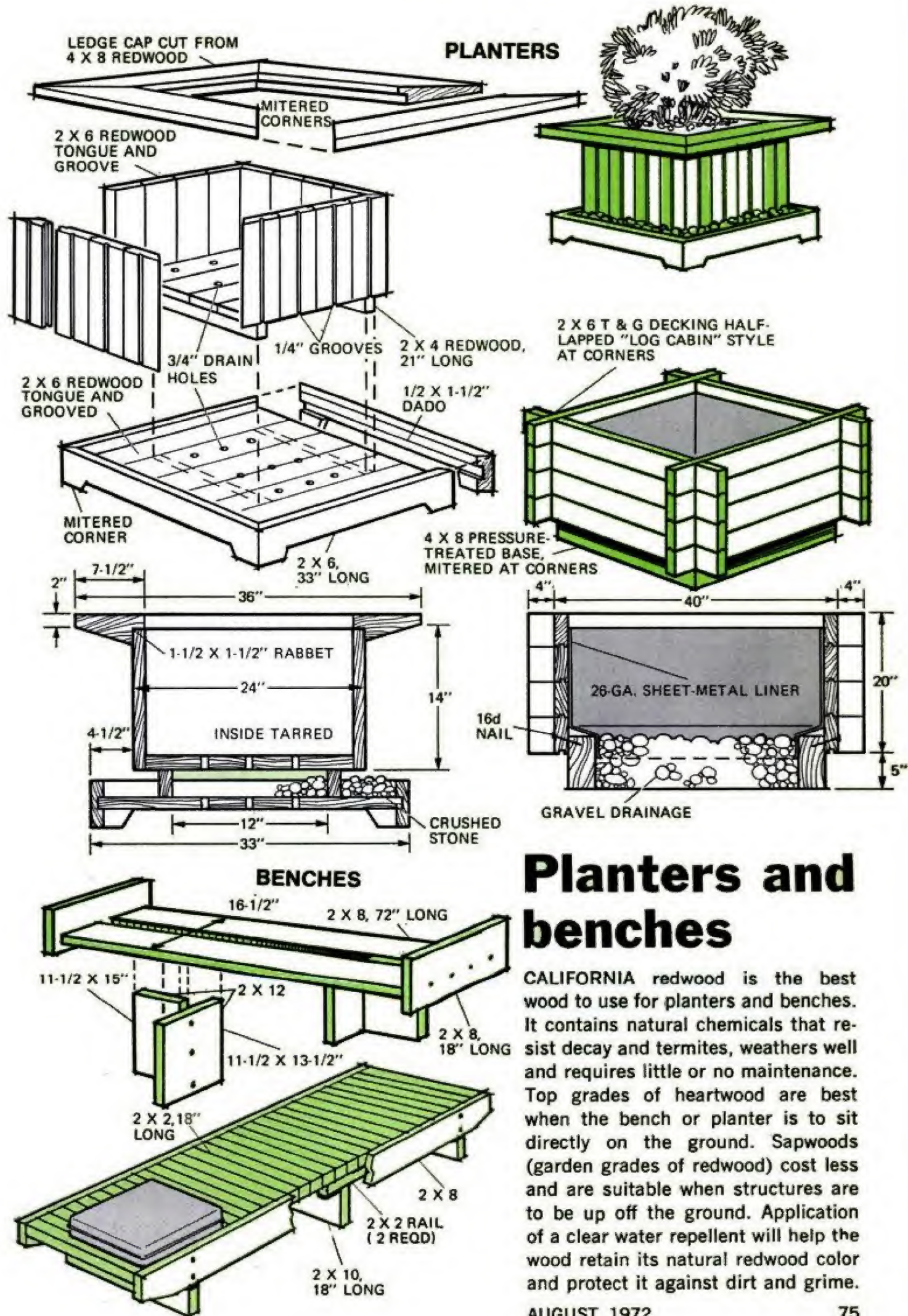
ALTERNATE WIDTHS ON ALTERNATE SIDES



BOTH SIDES OF THIS FENCE LOOK THE SAME



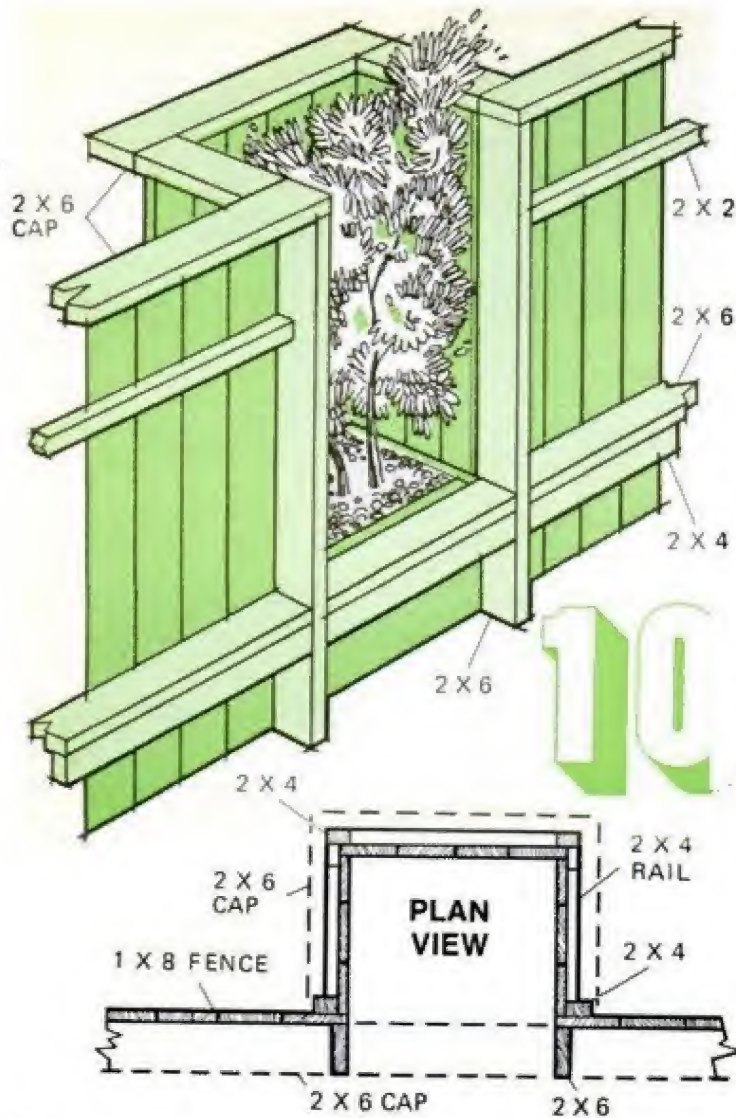
ANOTHER BOARD-AND-BOARD VARIATION



Planters and benches

CALIFORNIA redwood is the best wood to use for planters and benches. It contains natural chemicals that resist decay and termites, weathers well and requires little or no maintenance. Top grades of heartwood are best when the bench or planter is to sit directly on the ground. Sapwoods (garden grades of redwood) cost less and are suitable when structures are to be up off the ground. Application of a clear water repellent will help the wood retain its natural redwood color and protect it against dirt and grime.

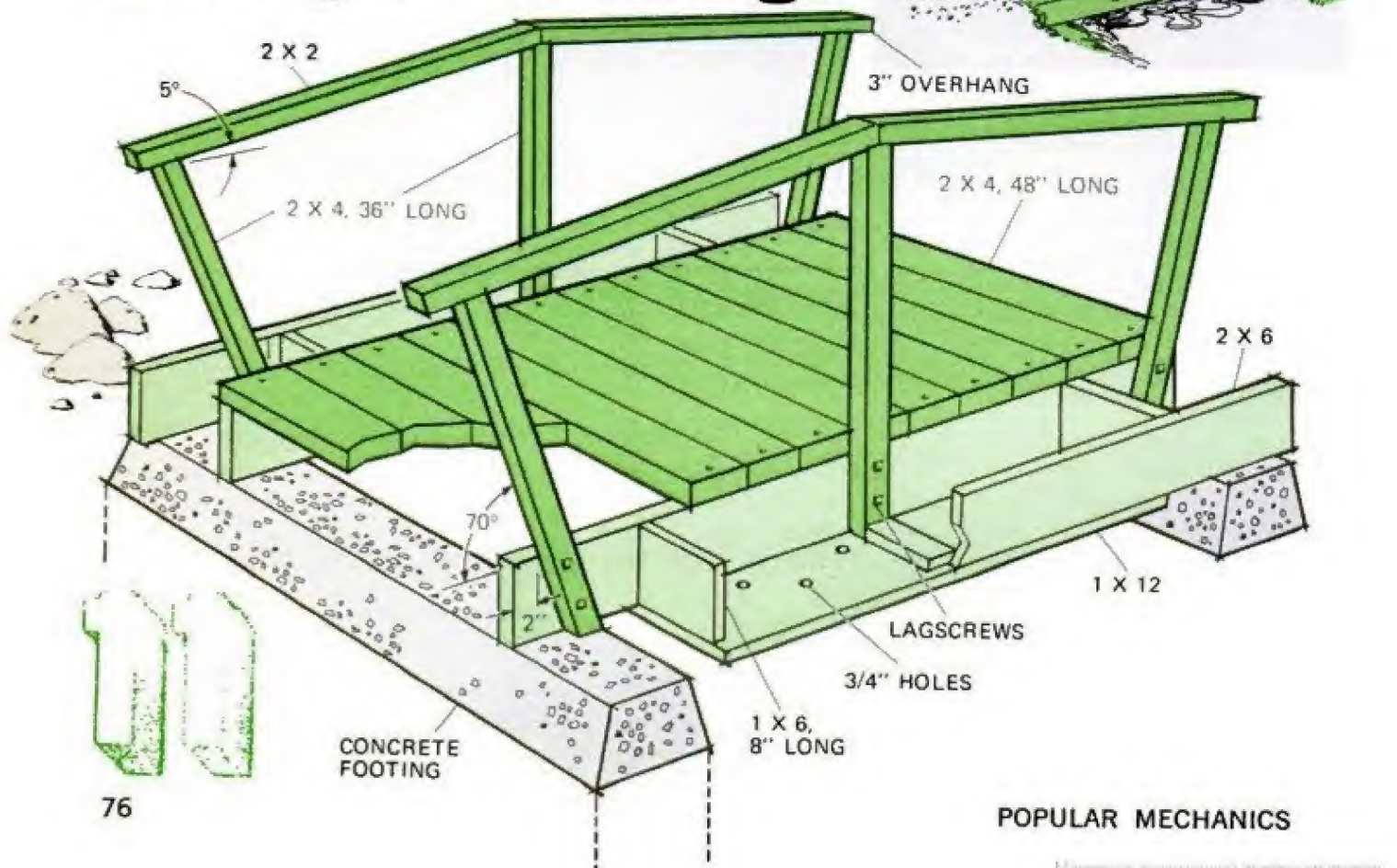
Fence niche planter

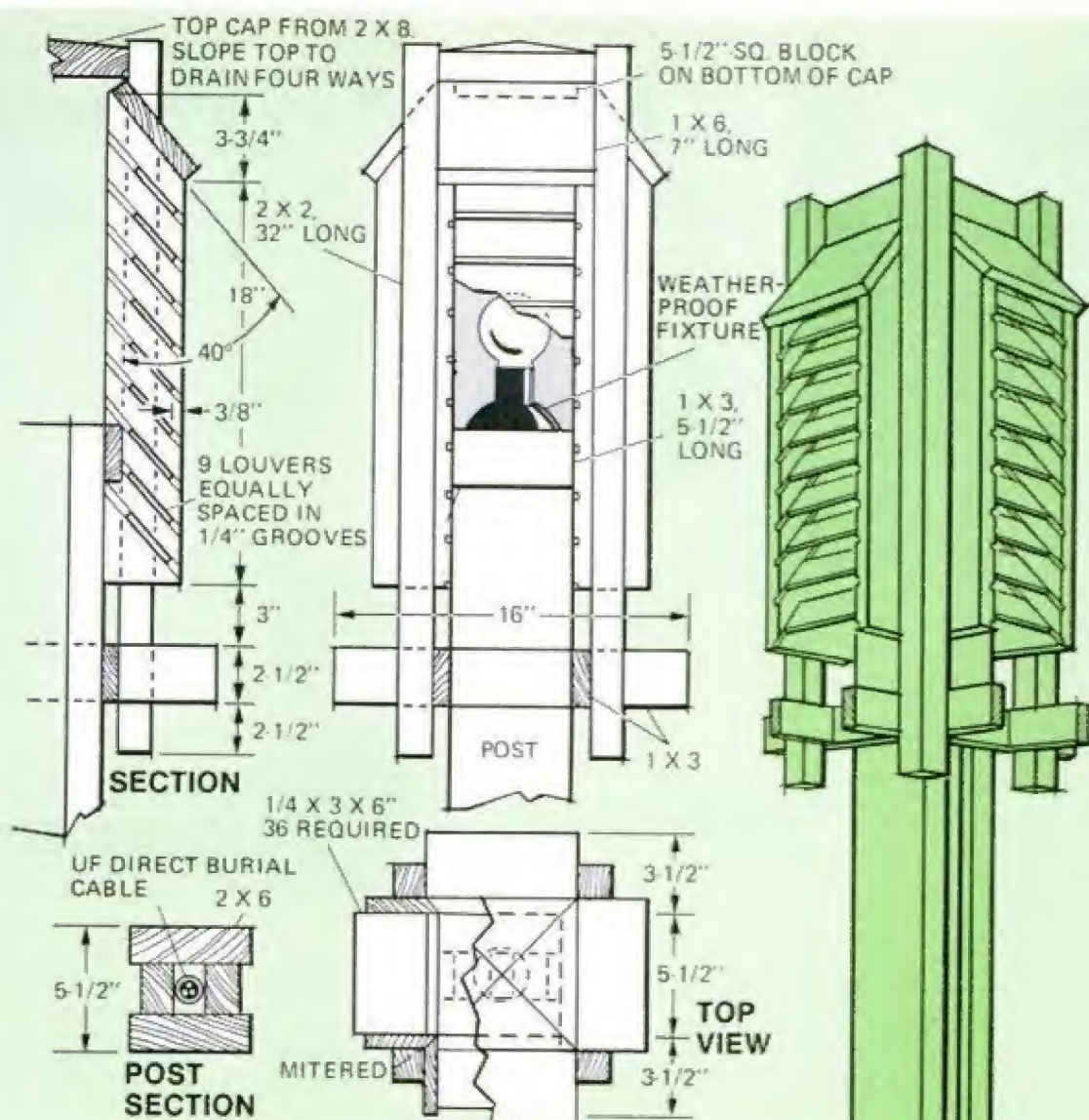


SOMETHING DIFFERENT in the way of planters are these niches that are framed as part of the fence. Besides being a novel feature that serves to break up a long expanse of plain fence, the enclosures actually afford protection to a plant from strong winds and at the same time provide extra bracing to the fence itself.

A small bridge, such as the one below with its built-in planter boxes, will add charm to a fish pond and rock garden. When building both these projects from long-lasting California redwood, use noncorroding nails (hot-dipped galvanized, aluminum alloy or stainless steel) so the nails won't discolor the wood.

Rock garden bridge





Handsome yard light

12

WOOD is always at home out-of-doors. It brings beauty, character and personality to every setting. A good example is this all-wood yard light. A most attractive addition to the yard during the day, it offers a dramatic nighttime effect with its unique louvered "shade." It's made of stock sizes of common lumber, including the built-up post. The shade slides down over the top of the post and is held by screws placed through the crossbars. A weatherproof socket and direct-burial cable should be used. Your local code may also call for conduit and lead-covered wires.



Playground equipment



Bouncing teeter board

It's possible to add playground equipment to your back-yard "family-fun center" without spending a great deal of money. With a little imagination, you can convert everyday items that no longer serve their original purpose into games for your youngsters. The teeter board, for example, is simply four coil springs from a car attached to an old wheel hub. Use a heavy truck tire for a base and a 2x10 plank for the board. Paint in bright colors.

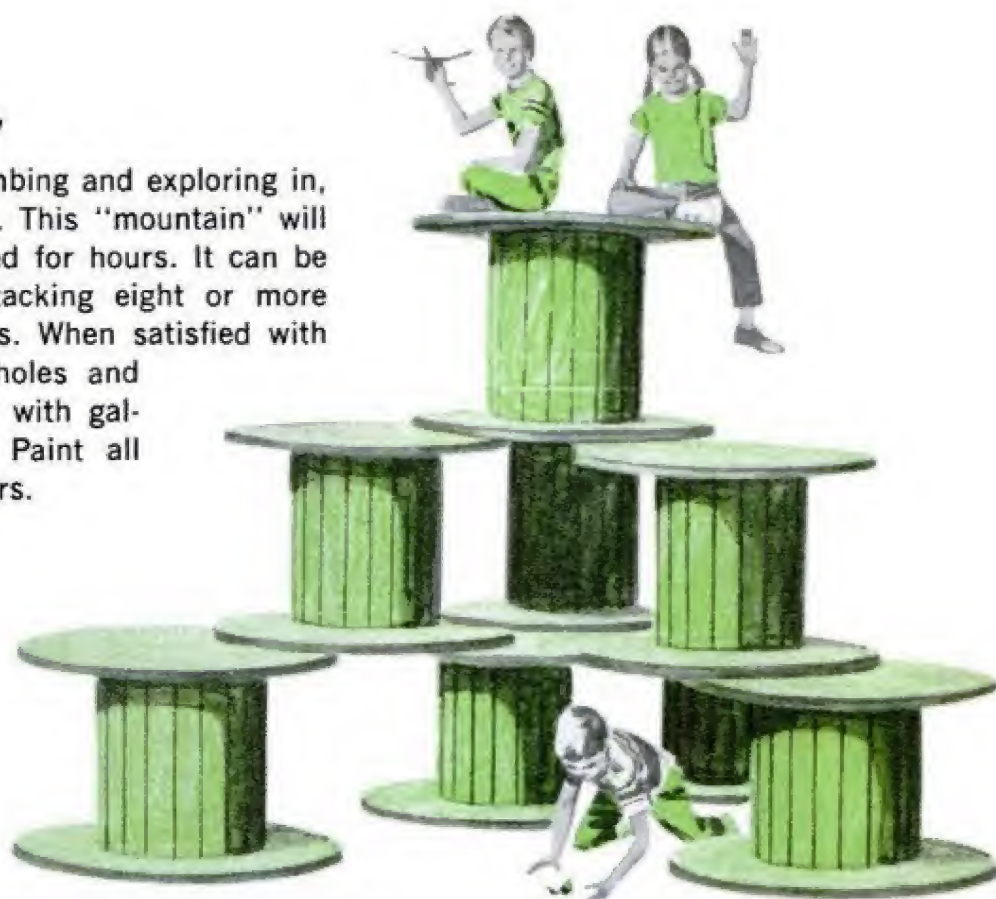


Merry-go-round swing

When you lay out the location for this toy, allow plenty of room so the kids can swing and twist on it in all directions. For a base, cut a 3-ft. disc from $\frac{3}{4}$ -in. exterior plywood. Bore four holes equidistant around the circumference 2 in. from the edge. Secure with short hemp ropes knotted below and fasten to a length of rope attached to an overhead horizontal cross-piece between two trees.

Wire-spool 'mountain'

Kids never tire of climbing and exploring in, over, under or wherever. This "mountain" will keep youngsters occupied for hours. It can be quickly fashioned by stacking eight or more large wooden wire-spools. When satisfied with the arrangement, drill holes and bolt the spools together with galvanized carriage bolts. Paint all parts in a variety of colors.



Stand-up swing

The whole gang has fun on a swing made of 2x6s, chains and posts. Plant the vertical posts at least 3 ft. in the ground, then notch and secure the crosspieces with strap iron and hefty hardware. Though most of the equipment shown on these pages should be painted bright colors, the wood parts on this one should be treated with preservative only. The plank, under any circumstance, should not have a slick surface.



14

One-piece fiberglass pool

RESEMBLING a giant bathtub, this one-piece, above-ground fiberglass swimming pool has a mirror finish that never needs painting and no leak-producing seams. Claimed to be stronger than concrete, it has outside and inside steps, with built-in skim-filtering system. The 12x25-ft. kidney-shaped pool is 2½ to 5 ft. deep, can be installed in as little as 72 hours. White or aqua pool weighs 2000 lbs., sells for \$3395 f.o.b. Swim-Gard, Inc., 950 Cooper St., Box 70, Deptford, N.J. 08096.



15

Prefabbed deck modules

FACTORY assembled and prestained Reddi-Deck patio sections are ready to install on level ground, gravel, sand or concrete. Durable redwood 2x4s in new 3x3 or 4x4-ft. packaged units interlock without nails in checkerboard or striped pattern, can be picked up and rearranged at will. Units are priced at \$12 and \$15. For more information, write Georgia-Pacific Corp., 900 S.W. Fifth Ave., Portland, Ore. 97204.





Electronics at the Olympics

Behind-the-scenes technical achievements will be almost as amazing as athletic prowess at the 1972 Summer Olympics in Munich this month. A "superlexicon" for fans and reporters, for instance, gives personal data concerning 15,000 athletes, officials, coaches and the like at the touch of a key (upper left). The Siemens system even provides lists of records, wins and rankings for all Games since 1896. A spirometric device (above), which instantly analyzes the physical condition of an athlete, is part of extensive medical facilities. And mobile relay stations (left) will allow television and radio signals to be transmitted from anywhere in the area.



GMC shows prototype of its 1973 motor home

Front-wheel drive and tandem rear wheels with independent air suspension are features of an experimental prototype motor home shown recently by GMC Truck & Coach Div.

The 26-foot recreation vehicle will be marketed in early 1973. Other features include an aluminum-and-fiberglass body, 455-cu.-in. V8 engine and automatic transmission.

PM **DODGE CHARGER** OWNERS REPORT

A nationwide survey based on 2,000,000 owner-driven miles

Blinded by style, owners overlooked rear visibility!



By MICHAEL LAMM, West Coast Editor Photos by the author

DODGE WENT to two wheelbases for its intermediate Coronet line in 1971. That model year all two-door Coronets became Chargers. It's the same for 1972—if you want a two-door Coronet, you buy the Charger.

Charger coupes and two-door hardtops now span a 115-inch wheelbase, as against 118 for Coronet sedans and wagons. Sheet-metal differences distinguish the Charger and leave it looking quite a bit flashier and more sporting than the Coronet.

Styling, in fact, became *the* reason most owners went for the Charger—nearly 68 percent said that the car's flowing design and sleek lines convinced them that this was the car they had to have.

On the other hand, it was this same factor—looks—that brought out owners' single strongest gripe: lousy rear visibility. The combination of smallish, back-angled side windows plus a steeply slop-

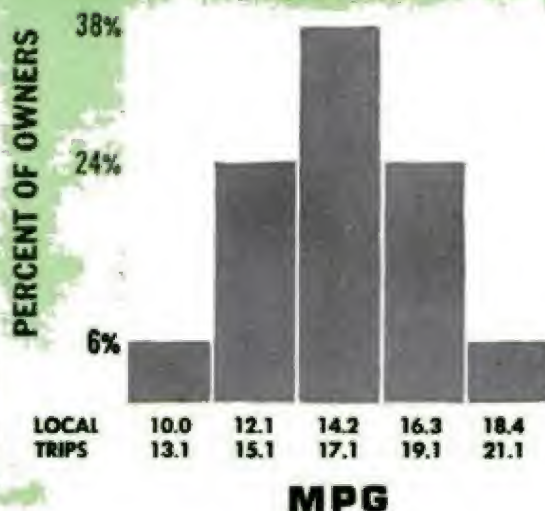
ing, boxed-in rear glass makes backing up or switching lanes a moment of truth. From the horse's mouth:

"Backing up is like driving with a paper bag over your head. This type of defect is stupid and dangerous." "Can't see the trunk out back—too many blind spots." "Rear window should wrap around roof because it's impossible to see what's coming at a Y intersection." "My rear passengers can't see out, and it's tough enough for me."

The Charger comes with Chrysler Corp.'s long-faithful, economical slant Six as basic standard equipment. Yet only 0.8 percent of our owners reported driving six-cylinder cars. Most chose the two-barrel 318-c.i.d. V8. This engine delivers good performance, they say, between 14 and 17 mpg. We'd estimate that the Six will better the 318's fuel economy by about two mpg all around, although data were

DODGE CHARGER FUEL-MILEAGE CHART

318-cu.-in. V8



EXCELLENT DRIVING POSITION and convenient reaches to all controls, report owners. Tach is available in Special Edition and Rallye packages. Huge doors make getting out a bit tough in tight spaces; some say doors are heavy when car is parked on slant

insufficient to verify this. The new-for-1972 400 c.i.d. V8 gets approximately two mpg less than the 318. Poor gas mileage cropped up as a notable complaint among only 7.2 percent of Charger owners, so most feel they're getting what's expected. Some aspects owners appreciate the most:

"Best-looking sports-type car with adequate room in rear seat and trunk." "Gets a lot of compliments." "Good handling with torsion bar suspension." "Goes like a rocket, and girls love it." "With the complete set of instruments, I can see what's going to happen instead of what happened." "Comfortable and lots of room." "Body is constructed like a high-performance aircraft fuselage." "Limited-slip differential makes my Charger handle well in winter."

As often happens when we ask about a car's workmanship, opinions vary: 57.3 percent rated workmanship "good to excellent," but only 6.0 percent voted the straight "excellent" ticket. Random jottings on that topic:

"Workmanship unsurpassed by any other car manufacturer." "For the price it should be better built." "As a police

AWKWARD POSITION OF GAS CAP makes it hard to tighten, slops out fuel. And a recurring complaint (as in many cars) is lack of vent panes

OWNERS WAX RHAPSODIC about Charger's looks, name it their primary reason for buying. Some, though, say high bumper and grille get dinged easily in parking, especially without optional guards (at \$16 additional)





HIGH LOADING SILL makes spare heavy. In place at front of trunk, it takes up valuable cargo space



GOOD HANDLING, roadholding, but wide pillars and small rear window make backing a time for prayer



officer, I drive many different makes of cars, and I find the Charger better than most in nearly every area. If the factory would pay a little more attention to small, not readily visible things, I feel the car would be about perfect." "What happened to the 50,000-mile warranty I had on my 1967 Coronet? They don't make them like they used to."

As to handling and comfort:

"I like the way the car handles in tight situations. It feels at home at any speed, and that doesn't change with road condition. Very pleasant to drive and ride. It also has quick acceleration necessary for entering expressways."

When we asked Charger owners what they would like changed, the overwhelming cry was for better rear vision. After that:

"More legroom in back." "Better bumpers; front one gives no protection, and guards are useless." "A better rear-window defogger. It's the blower type, and I much prefer the wire ones." "Better quality tires as standard equipment." "A flow-through ventilation system that works." "Go back to vent windows."

One nagging complaint centered on the Charger's being hard to start (7.7 percent of all owners mentioned this, with about half of them saying it happened only in cold weather; the other half got it only in trying to restart a fully warmed-up engine). It's a puzzler that's cropped up in other Owners Reports of Chrysler Corp. cars and a few other makes. No one seems to know the precise cause. Opinions range from "stuck choke" and "smog junk" to "that's the way it is."

What about dealers and dealer service?

"I am treated like a best friend." "Sales

MOST OWNERS CHOSE 318 V8, found it tough, economical, but a few mentioned some starting problems

HORN'S HARD TO HONK while turning, mirror sometimes blocks view, but dashboard is well laid out



Summary of 1972 Dodge Charger Owners Reports*

Total miles driven2,036,997

Average miles per gallon

318-cu.-in. V8: local driving .14.2
long trips .17.1
400-cu.-in. V8: local driving .12.4
long trips .15.1

Engines:

225-cu.-in. Six0.8%
318-cu.-in. V865.5
340-cu.-in. V83.0
400-cu.-in. V828.4
440-cu.-in. V82.3

Transmissions:

Automatic95.8%
4-speed manual2.7
3-speed manual1.5

Body styles:

2-door coupe11.2%
2-door hardtop88.8

Models:

Charger SE85.7%
Charger 50014.3

Why the Charger?

Styling67.8%
Past experience16.7
Price8.5
Size6.6

Specific likes:

Styling62.1%
Handling50.2
Comfort24.9

Ride21.0
Economy19.8
Performance16.2

Specific dislikes:

Poor rear vision30.0%
Rattles13.2
Low gas mileage7.4
Harsh ride5.8
Poor workmanship5.9
Poor dealer service4.3

What changes would you like?

Better rear vision32.0%
More rear legroom6.5
Change styling5.6

Had any mechanical trouble?

Yes54.5%
No45.5

What kind of trouble?

Carburetor15.4%
Transmission14.7
Airconditioning8.4
Windshield wipers7.7
Electrical7.7
Cold starts7.7

Did you repair it yourself?

No94.5%
Yes5.5

Dealer repairs satisfactory?

Yes63.4%
No36.6

Is the Charger your only car?

No52.6%
Yes47.4

Other cars owned:

Dodge28.0%
Ford23.2
Chevrolet16.1
Plymouth9.9
Chrysler7.8

Accessories/power options:

Automatic transmission95.8%
Power steering and brakes (both)70.4
Airconditioning55.2
Radio46.2
Rear defroster29.5
Power steering24.0
Vinyl top21.5
Tinted glass15.9
Rear speaker15.5
Bucket seats13.9
Stereo tape12.8

Age distribution of owners:

15-2947.7%
30-4932.0
50-plus20.2

Would you buy another Charger?

Yes76.0%
No24.0

*Percentages might not equal 100% due to rounding and/or insufficient data.

department good, service department fair." "The man understands how to get along with people—isn't pushy." "Slow to make repairs; discourteous sales personnel." "Had to make five trips to one dealer because the hidden wipers wouldn't park correctly. He never did fix them. Took it to a second dealer who put it back like new." "Was completely pleased with every aspect of my transaction with this dealer."

Charger owners tend to be young, with nearly half of our respondents under 30. Contrast this with Saab owners (see pages 46-49), who are evenly divided in all age groups. Since younger owners logically expect changes in their lives—in family size, situation, income, status—nearly a quarter said they probably

wouldn't buy a Charger next time. This probably isn't so much a reflection on the car itself as on the fact that it's a young person's choice.

We'll leave the final summation to a 25-year-old Philadelphia technician, who writes: "This is my second Charger, my first being a 1968. I drove the '68 almost four years and 65,000 miles and had no major problems. I've had this 1972 Special Edition about seven months now, and it's performing as good as, if not better than, my previous Charger. If Dodge continues to build Charger this well, then I don't think I'll ever buy any other kind of car. I like to go for long rides in it on my days off. The Charger is very relaxing. My only complaint is that I cannot drive it all day, every day! ★★

CHARGER ROOFLINE is one of the styling elements that captured highly style-conscious buyers of the car





GLASSES THAT "SEE" for the blind are among many ingenious innovations enabling the sightless to move about with newfound freedom and confidence. The electronic detection system is based on the use of invisible infrared rays beamed forward from a tiny light-emitting diode housed in a small tube along one side of the eyeglass frame. If the rays strike an obstacle in the user's path, reflections bounce back and activate a photo-diode receiver in a similar tube on the other side of the eyeglass frame. This triggers an alarm circuit that sounds a warning tone in the user's ear, telling him that an obstruction lies ahead. Advantage of the system is that it detects objects above waist level like a tree branch, as shown in photo at left and in drawing on facing page. Photo on facing page shows how circuit boards, diodes and batteries all fit into the two slim, 1/2-inch-diameter tubes



Electronic 'eyes' let

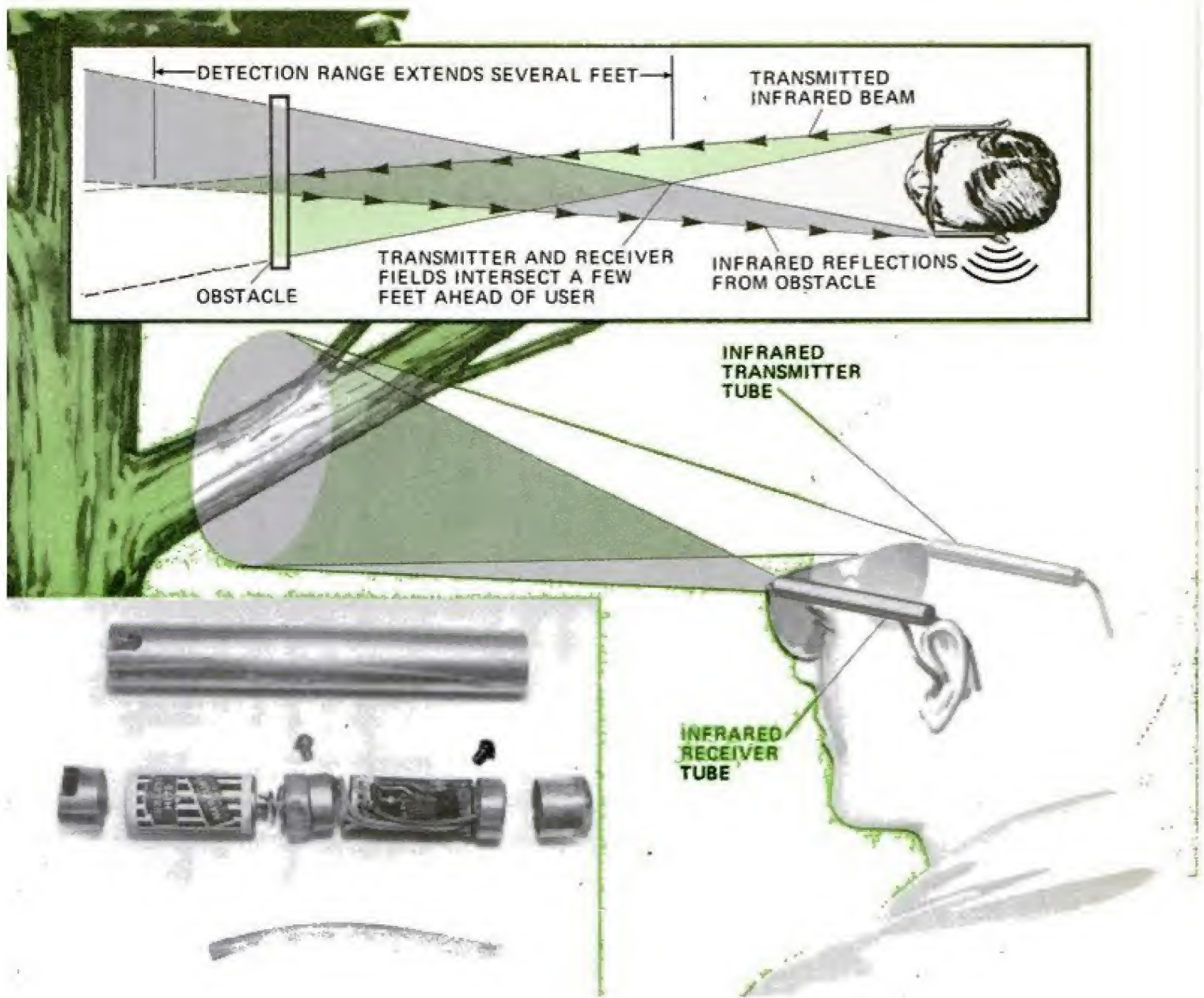
Radarlike glasses, portable reading devices, even artificial eyes that screw into place like a camera lens, are among miraculous new aids for the blind

By SHELDON M. GALLAGER

THE OLD EXPRESSION "as blind as a bat" will soon be a thing of the past. Not only do bats get around better than most people with perfect vision, but their remarkable built-in sonar-like guidance system may well serve as the model for similar aids to help the blind navigate almost as well as a person with full sight.

One such aid is a clever electronic detection system invented by Forrest M. Mims, a young electronics engineer from Albuquerque, N.M. The Mims system, shown on this and the facing page, works something like sonar and radar except that invisible infrared light rays are used in place of sonic pulses or radio waves.

POPULAR MECHANICS



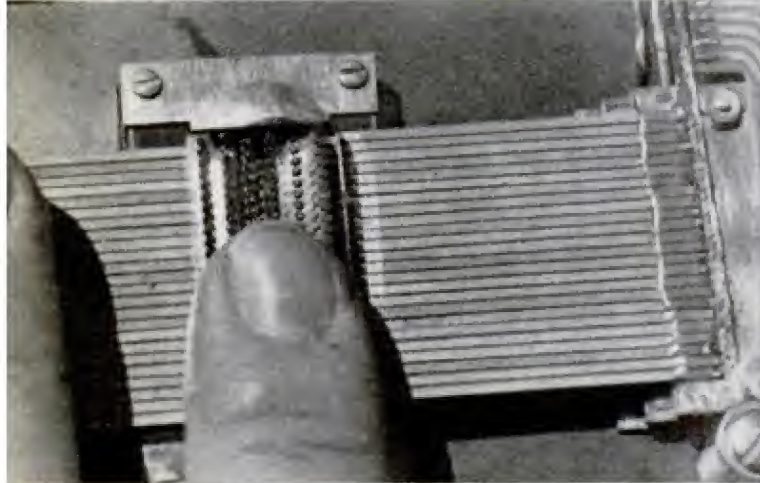
the sightless 'see'

The device consists of two slender tubes attached to a pair of ordinary sunglasses, one on each side. From one tube, infrared rays are transmitted in a pulsed beam from a light-emitting diode (LED). When the rays strike an object, some of the light is reflected back and picked up by an ultrasensitive photo-diode in the second tube on the opposite side of the eyeglass frame. This triggers an alarm circuit that sounds a 300-cycle warning tone heard through a tiny tube inserted in the user's ear. By moving his head slightly up, down and sideways, the user can readily "scan" the obstacle to tell if it's something narrow like a post or tree that

he can step around, something with an opening in the middle like a doorway that he can walk through, or something broad and flat like a wall or fence that he must turn away from.

Unlike guide dogs, canes and other hand-held detection devices, Mims's "electronic eyes" have the advantage of closely approximating the location and movements of a person's real eyes—they "look" wherever the user looks, simulating normal vision. They also detect objects above waist level, such as low-hanging signs, awnings, tree branches and the like, that a cane might easily miss.

Although the system is capable of spot-



NO BIGGER than a portable tape recorder, this remarkable aid enables the blind to read any ordinary printed type without need for a braille translation. A photoelectric sensor on the end of a cord is simply moved across the printed page (upper photo above), while the user holds a finger lightly against the rows of tiny vibrating pins (lower photo above). The optical images picked up by the sensor are transformed into similar shapes by the vibrating pins. The tingling sensations that are produced by the pins thus permit the user to "feel" one letter after another as the sensor scans the printed type. Photo at the right shows a blind Berkeley, Calif., student using the portable Optacon device to "read" a notice posted on a school wall. This aid is now under development at Stanford University



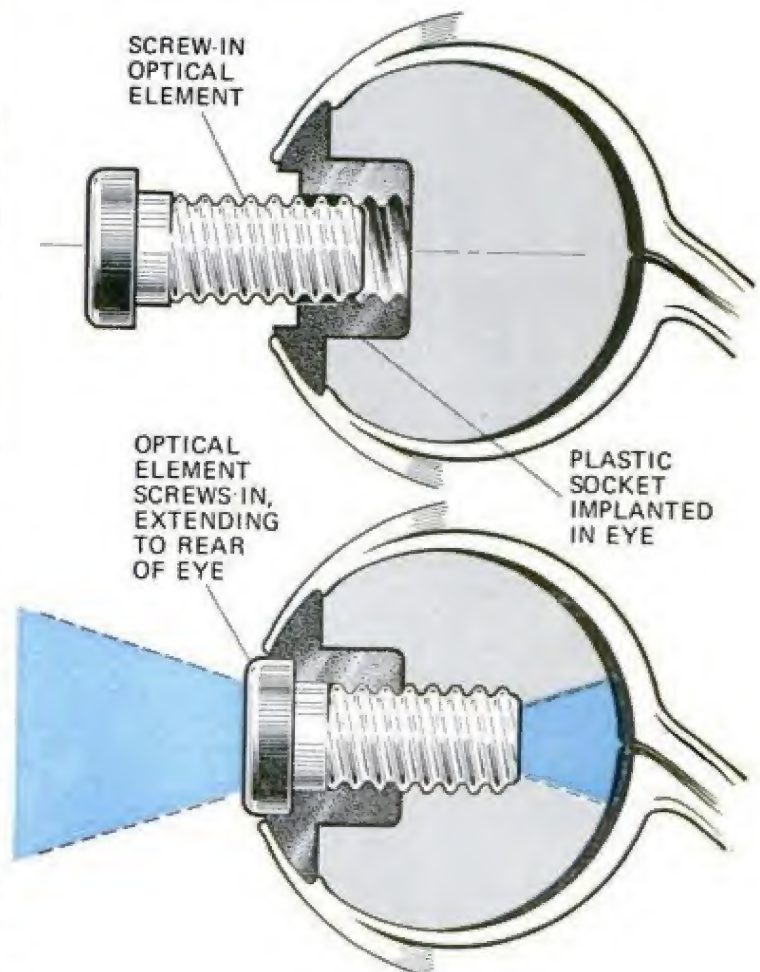
ting objects up to 50 feet away, the transmitter and receiver tubes are deliberately angled so their fields of view converge a few feet ahead of the user. This restricts the coverage to obstacles within immediate range. Mims points out the arrangement is also helpful in locating desired objects. A person entering a room, for instance, can find a chair to sit in merely by scanning the area briefly until the signals indicate something resembling the shape and size of a chair. With practice, users soon can tell different objects by recognizing familiar signal patterns.



ARTIFICIAL CORNEAS are restoring sight to many blind persons in cases where live corneal transplants either have failed or can't be performed. The technique, developed in England, consists of first implanting a threaded plastic socket into the eye, as shown in the drawing at right. A barrel-shaped plastic lens (top photo at right) is then threaded into the socket with a special "screwdriver" (top photo at left). The photo immediately above shows actual eye implant after operation is complete (tiny post at right is used to prop eye open during surgery, will be removed.) Because eyes normally reject such foreign bodies, method was thought to be impossible until surgeons, removing shattered canopy fragments from the eyes of injured fighter pilots, found that the special windshield plastic used in the planes would not react harmfully with eye tissue

At present, the system provides only a single signal for a fixed range, but Mims is now at work on more sophisticated versions that will contain two or more infrared beams pulsed at different frequencies and aimed to converge at different distances. Each infrared frequency would cause the receiver alarm circuit to emit a different warning tone. Thus a user would hear one tone at, say, 8 to 10 feet, another at 4 to 5 feet and a final one at 1 to 2 feet. Such a system would tell not only how far away an obstacle is but also how fast it's approaching.

AUGUST 1972



The Mims device is not the only electronic detection system being developed, but it is so far one of the smallest and least expensive. The twin transmitter and receiver tubes are only a half inch in diameter and 3½ inches long. Together, they weigh less than three ounces, including batteries and eyeglass frame. Mims thinks the elements can be further miniaturized to fit right inside the eyeglasses themselves and thus be virtually unnoticeable. Prices are expected to range around \$300 to \$350—not much more than the cost of a good-quality hearing aid. The Veter-



HAND-HELD DETECTOR is based on same system as infrared eyeglasses. It's handy for some situations, but most users prefer eyeglass version because it follows head movements automatically

ILLUMINATED VIEWER above allows legally blind persons with very low vision to read books, magazines, newspapers and other printed matter by displaying a greatly enlarged image of the type on a 9 by 14-inch rear-projection screen. Called the Optiscope, it can also be used to provide magnified views of pictures and drawings (left, above). Device is made by Opaque Systems, Ltd., of Hempstead, N. Y., and it sells for \$295

ans Administration is testing two of the aids, and the American Foundation for the Blind has expressed a strong interest in the device.

Meanwhile, research in the use of laser-actuated detection devices has also taken a giant step forward. Such detectors work somewhat like the Mims aid except that laser beams are used instead of infrared radiation. A laser beam is directed toward an obstacle, and its reflections are picked up by a light-sensitive receiver spaced

(Please turn to page 178)



READING A BOOK is easier for the blind with this novel Optophone device that converts printed type into audible sounds. The book is placed face down on top and a moving beam of light underneath scans the page, a line at a time, at a rate that can be controlled by the user. The beam is made up of six tiny points of light whose reflections form light and dark images corresponding to the shapes of the letters scanned. These images are then translated electronically into patterns of musical tones, one for each letter of the alphabet, something like the dot-dash patterns in Morse code. A person using the device memorizes the tonal patterns, learning to distinguish entire words almost at once



8000 miles in a Model T camper

Photos by Dick Barney



BACK IN '35 Dick Barney got a 1916 Model T at a good price—in exchange for replacing brake linings on the owner's other car. When friends asked Barney what he wanted with such an old buggy, he'd reply: "I'm going to drive it across the continent some day."

Thirty-five years later, on Apr. 6, 1970, he pulled away from the city hall in Portland, Ore., on the first leg of a trip that would take him to Portland, Me., and back. On the way, the 58-year-old proprietor of a music and camera shop would visit sons in Wisconsin and Massachusetts.

First, he had to rebuild the old car. He mounted a camper body on the chassis and installed a 12-volt electrical system to provide juice for lights, wipers and a refrigerator. He overhauled the engine, replacing piston rings, valves, springs and timing gears. Critical parts, unavailable 25 years ago, are back on the market to meet the needs of old-car buffs. But not all parts, Barney warns.

As his experience shows, you don't take a lengthy junket in an antique unless you're a pretty fair mechanic. Most of today's gas station attendants can't even find

DICK BARNEY GETS the feel of his Model T after inspecting chassis. He repaired a rusted-out wheel rim with plastic, replaced ball bearings in wheels
AUGUST 1972



the gas tank on a Model T (under the driver's seat) or oil level indicator (two petcocks on the transmission housing).

Barney made a number of repairs en route. Typical was the way he replaced a broken coilbox contact plate that was keeping the No. 3 cylinder from firing. Since he could not lay his hands on a replacement, he fashioned one from the lid of a grapefruit-juice can. It held up for the next 4500 miles.

He chuckles when he recalls an experience on a steep grade in New York's Catskill Mountains. He was behind a heavily loaded truck grinding toward the top of the hill. Though the "T" could do about 35 mph on a level road, it wasn't much on hills. In low gear—the Model T has but two gears—the car managed from 7 to about 15 mph.

When Barney found that he was slowly gaining on the truck, he decided to pass. "I pulled into the inside lane," he recalls, "with the throttle wide open. As I crawled abreast of the truck we rounded a curve and came in view of a highway work crew. They saw that a 'race' was in progress and cheered as my Model T pulled into a half-length lead. I felt as though I'd just won the Indy 500." ★★★

READY TO ROLL AGAIN after completing repair in Mitchell, Ore. On second day out, a throw-out collar on clutch had broken, requiring replacement



REBUILT ENGINE did not retain refurbished look for long once trip started. A characteristic of Model T engines, says Barney, is a tendency to leak oil



Whatever you drive, wherever you go,
Pennzoil is worth asking for.



Latest U.S. Government figures show

Pall Mall Gold 100's lower in 'tar' than the best-selling filter king!



Yes, longer yet milder.



PALL MALL GOLD 100's... "tar" 18 mg.—nicotine, 1.3 mg.
Best-selling filter king..... "tar" 20 mg.—nicotine, 1.4 mg.
Of all brands, lowest..... "tar" 1 mg.—nicotine, 0.1 mg.

18 mg. "tar", 1.3 mg. nicotine av. per cigarette, FTC Report APRIL '72.



A LUNG-POWERED "MELODICA" was intended for diversion while driving. But Barney soon abandoned the idea in interest of safety, limiting his musicmaking to stops at gas stations and parking lots



BARNEY'S ANTIQUE CAMPER drew onlookers at almost every stop. Typical was group of men in Buffalo, Mo., who inspected vehicle from high sidewalk

WHEN THE CROSS-COUNTRY DRIVER pulled into the parking lot of the Maine Tourist Information Center at Kittery, he was given enthusiastic greeting by members of MOAL—Maine Obsolete Auto League



LAST OF TRIP'S THREE FLATS was discovered on the morning of final day out. Locating a slow leak in tube called for an improvised water immersion test

THE INTREPID TRAVELER was given an official welcome by Terry Strunk, mayor of Portland, Ore. The slow-paced trip took the better part of two months



A paddlewheel riverboat

Little Toot is a small version of riverboats once common in America. This beauty of a boat was built under a tree in a yard in Kentucky

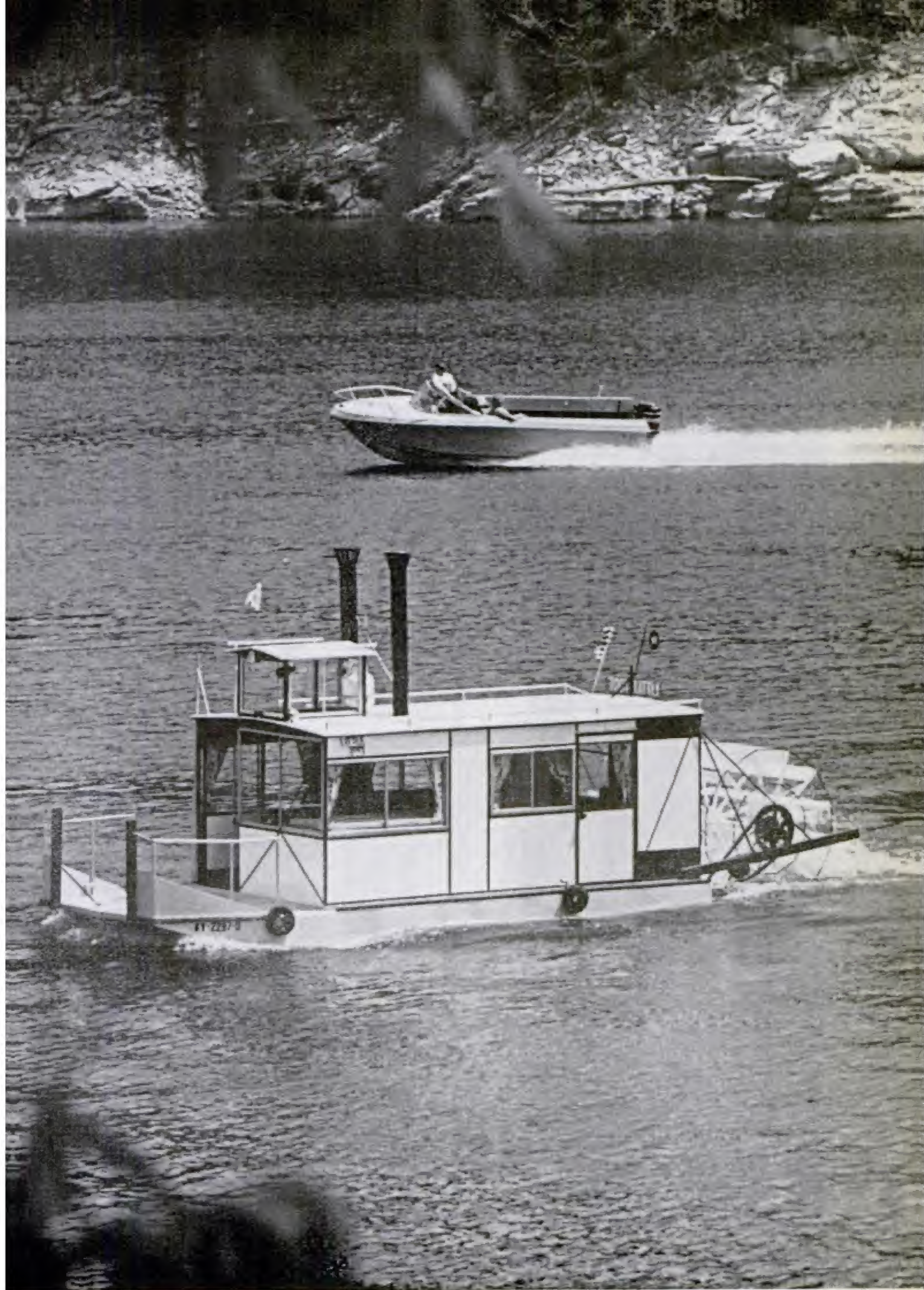
Photos by James Pickerell

BENNY POWELL is the kind of craftsman who delights in transforming commonplace materials—even junk—into something useful and handsome. Some years back he built a “vintage” touring car from parts salvaged from several old autos (*Right Out of the Roaring Twenties*, page 76H, Nov. '71 PM). A love of paddlewheel riverboats led him to an even more ambitious project—the construction of *Little Toot*. Powell labored for three years before he had the boat shipshape.

What makes the accomplishment doubly impressive is that the inventive

TAKEN FROM '60 FALCON, this 90-hp engine burns about a gallon of gas an hour as it pushes boat at cruising speed of 5 mph. Against after bulkhead (below) are two-burner stove and an oven, fueled by gas from cylinder atop deckhouse. Old-fashioned kerosene lamps provide light







WITH FRIEND AT WHEEL, Benny Powell and his wife sun themselves on foredeck. Cupola atop deckhouse is ornamental. Paddlewheel (top left) is made of six-foot planks bolted to an angle-iron frame. Heavy chain turns sprocket wheel. An array of whistles (left) gives *Little Toot* its name. Compressed air comes from tank that's kept at full pressure by a compressor from an automobile airconditioner. Inside deckhouse, helmsman sits amidships on the forward edge of the engine cover. Twin "stacks" run up through the roof; one of them is a ventilator

craftsman worked without drawings and, mostly, without help. Powell has but one arm, having lost his right arm in World War II.

Powell welded sheets of 12-gauge iron into a hull, framed the deckhouse in angle iron and covered deck and house with half-inch plywood. He built the hull under a tree in his yard, the deckhouse in his shop. He assembled the boat with a chain hoist slung from a tree branch.

Little Toot is 20 feet long and 8 wide, and displaces 2½ tons. Powell hauls it on a trailer built on a mobile-home axle. The engine, a gift, had 94,000 miles on it before Powell had it rebuilt. The storm windows used for the deckhouse were "borrowed" from the Powell home. He estimates his total cost (including the price of new storms for his house) at \$1500.

The Powells enjoy cruising on the Kentucky River near their home in Danville, Ky. Benny is one boater who really earned his hours of relaxation on the water. ★★ ★



Australia's jet-powered drone flies at 400 knots

The Turana, newly developed by the Australian Government Aircraft Factories, is claimed to be the most versatile guided target drone in the world. Launched by rocket

motor (that is jettisoned), the craft flies up to 400 knots, powered by a small jet engine. It can execute evasive maneuvers, then parachute to earth for recovery.



A fountain to walk through

San Francisco's Vaillancourt Fountain, a giant piece of sculpture that emits water and, occasionally, steam, has walkways built into it to enable visitors to walk beneath several arms that are gushing water.





Sidewinder: pretty, perky performer



GOOD LOOKS and performance are incorporated in Sidewinder design. Spoiler hangs down from fuselage

SMOOTH LINES SWEEP back to tail, constructed of steel and aluminum and covered with aluminum skin



This slick two-seater has won several awards for craftsmanship and design. You can build it for about \$3500.

By **JOHN F. PEARSON**
and **HOWARD LEVY**

Photos by Howard Levy

AS AN EXPERIENCED PILOT, Jerry Smyth knew what he wanted in a homebuilt plane: sleek lines, good speed and the structural strength to withstand the stresses of aerobatics.

After he had completed the design, it took him two years of spare-time work to

POPULAR MECHANICS

turn blueprints into the finished product. In February, 1969, the perky Sidewinder was ready for testing. Since then the plane has won awards for design and workmanship in competitions sponsored by the Experimental Aircraft Assn. The EAA is an international organization that many homebuilders belong to.

The Sidewinder is a side-by-side two-seater of all-metal construction. It is stressed for nine Gs (nine times the pull of gravity).

Tubular spring steel is used in the tricycle landing gear, which is fixed. The nose wheel can be swiveled 70°. Instead of using wing flaps to slow the plane, there is a dive brake, or spoiler, under the fuselage.

With a Lycoming 125-hp engine, the plane has a top speed of 200 mph, cruises at 160 and has a 450-mile range. It can climb at a rate of 2000 feet per minute and has a service ceiling of 10,000 feet. Landing speed is 55 mph.

The plane is almost 20 feet long, has a wingspan of 24 feet 10 inches and stands 5 feet 5 inches high. Its empty weight is 867 pounds and the gross weight is 1400 pounds.

Smyth estimates a cost of between \$2500 and \$3500 for materials. He has sold about 290 sets of plans and knows of several planes that are under construction.

Plans cost \$125. If interested, write: Jerry S. Smyth, 3224 Beaver Ave., Fort Wayne, Ind. 46807. ★★★



THE SIDEWINDER has a fixed, tricycle landing gear with spring-steel supports. For easy maneuvering on ground, the nosewheel swivels as much as 70°



THE PLANE features an exceptionally clean instrument panel layout. There are dual controls—except for brakes—as indicated by two control sticks

SLIDING PLEXIGLASS CANOPY is snug-fitting, easy to open and close. Sidewinder is less than 20 feet long, has a wingspan of nearly 25 feet, can take off

with 800-foot run, land with 1200-foot roll, cruise at 160-mph with maximum speed of 200, climb at rate of 2000 feet per minute to a ceiling of 10,000 feet





HUNDREDS OF PARTS (not all shown here) take about 40 to 50 surprisingly easy hours to assemble

A \$700 receiver in a

Heath calls this its finest. PM agrees.

HEATH CHARGES about \$700 for the wired version of its AR-1500 AM-FM receiver, \$389 for the kit. So you get more than just fun from the 40 or 50 hours you'll spend in building it—you save about \$7 per hour.

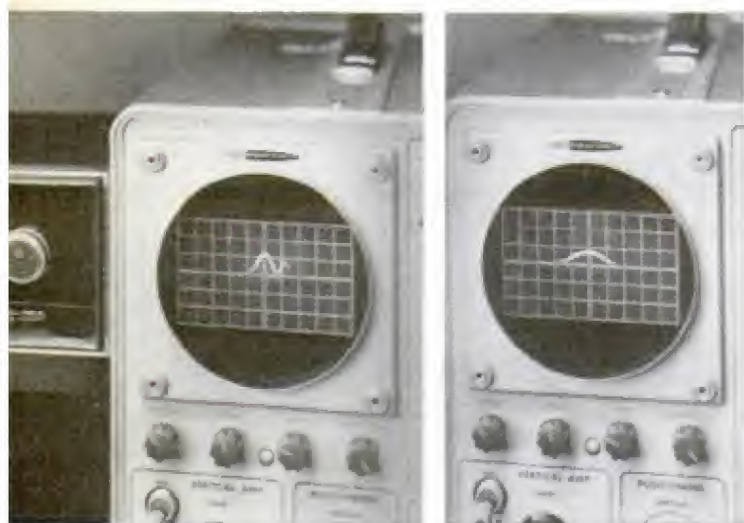
The AR-1500 is one of the most time-consuming kits I've ever built—it took about as long as my Heathkit color TV did. But it's also one of the easiest. That's because Heath divides most of the labor into 10 subkits—the 10 circuit boards,

each packed with its own, manageably small complement of parts, and each with its own section in the instruction manual.

Assembling the chassis—normally one of the easiest parts of any kit—is the hardest part of this one, since it comes in 12 pieces, and wires must be connected to 228 points. Heath simplifies this, too: almost all wires are bundled into one, precut circuit harness. (Nonetheless, I found it helped to number each of the harness's 16 ends with Brady Wire-markers.)

Wiring errors on solid-state equipment can blow transistors faster than you can say "poof!" So the AR-1500 has built-in test leads that let you use its signal-level meter to check resistances and voltages before you actually turn on the set.

Once you have it running, the Heath's performance is sensational. Using only rabbit ears on the second floor of a steel-framed apartment house, I could pull in almost every station in a 40-mile radius—and some as many as 60 miles away. For the weakest stereo signals, I had to cut the noise with the "blend" switch (which reduces separation, mostly at the high frequencies, without eliminating it altogether). Only on the weakest signals—or those with excessive multipath—did I have to switch all the way to mono.



OSCILLOSCOPE OUTPUT JACKS let you aim your antenna to eliminate multipath interference (left), get a strong, undistorted signal (right). Your scope needn't be as fancy as this Heath model, either



IT'S HANDSOME, even without optional wood case

\$400 kit

By IVAN BERGER, Electronics Editor

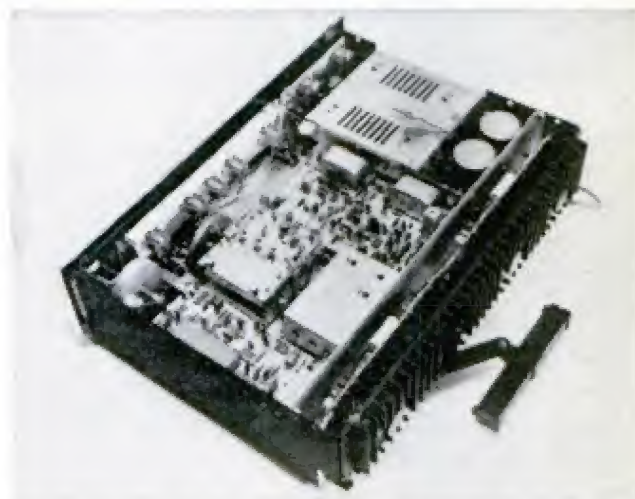
The muting circuit reduces interstation noise effectively, and doesn't cut out till each station is almost perfectly tuned in. That keeps you from hearing the fuzzy fringes of the signal. But it also makes it easy for you to tune right past weak stations if you're not careful. There were no pops or thumps as the stations came in, but I still found the transition from silence to signal annoyingly abrupt. I liked the way the muting could be turned down for reception of weak stations. Heath claims the sensitivity is $1.8 \mu\text{V}$ (IHF), selectivity is 90 decibels (db.) and capture ratio is 1.5 db.; if anything, I'd say they were conservative.

If the FM performance impressed me, the AM performance both impressed and surprised me. Noise and distortion sound almost as low as on some FM units I've used; the only AM giveaway was the limited high-frequency response. The AM antenna rod is jointed, so you can position it for best reception. But, folded in, it covers the rear-panel jacks.

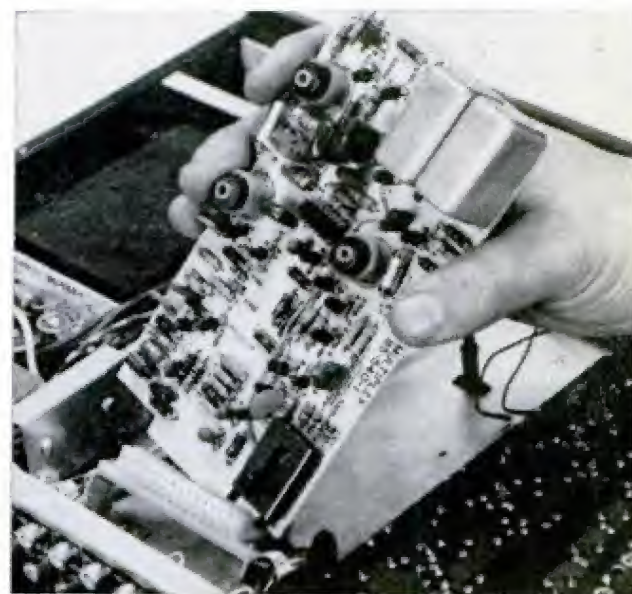
The jacks are inaccessible in any case, because they're deeply recessed beneath the heat sink. But all the jacks you really need are there: PHONO, AUX, TAPE and MONITOR inputs, RECORD outputs, the multipath scope terminals, and jacks to

(Please turn to page 176)

AUGUST 1972



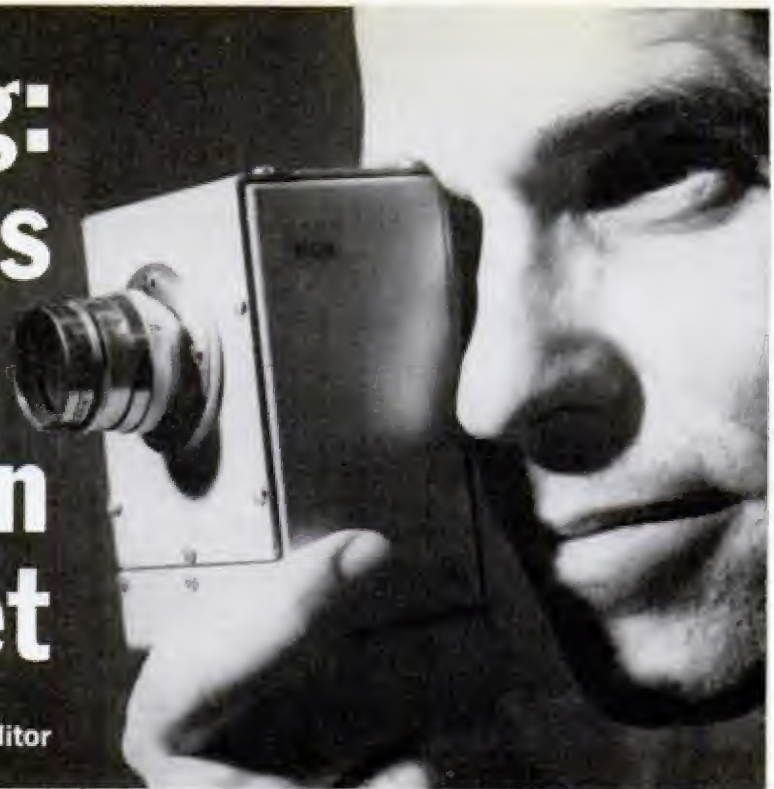
COMPLEX TOP VIEW shows where some of the work went; equally complex bottom view would show the rest. But each of the 10 circuit boards is a kit in itself, so you don't bog down in wires and components



PLUG-IN CIRCUIT BOARDS—four of them in hinged sockets—make the assembly, adjustment and circuit checking easy. Multiplex board shown here has an integrated circuit decoder. Switch is for alignment

Coming: TV cameras you can carry in your pocket

By IVAN BERGER, Electronics Editor



TELEVISION CAMERAS so small you can carry one in your vest pocket are on the way. The breakthrough? Solid-state "image sensors" that will replace today's bulky vidicon camera tubes.

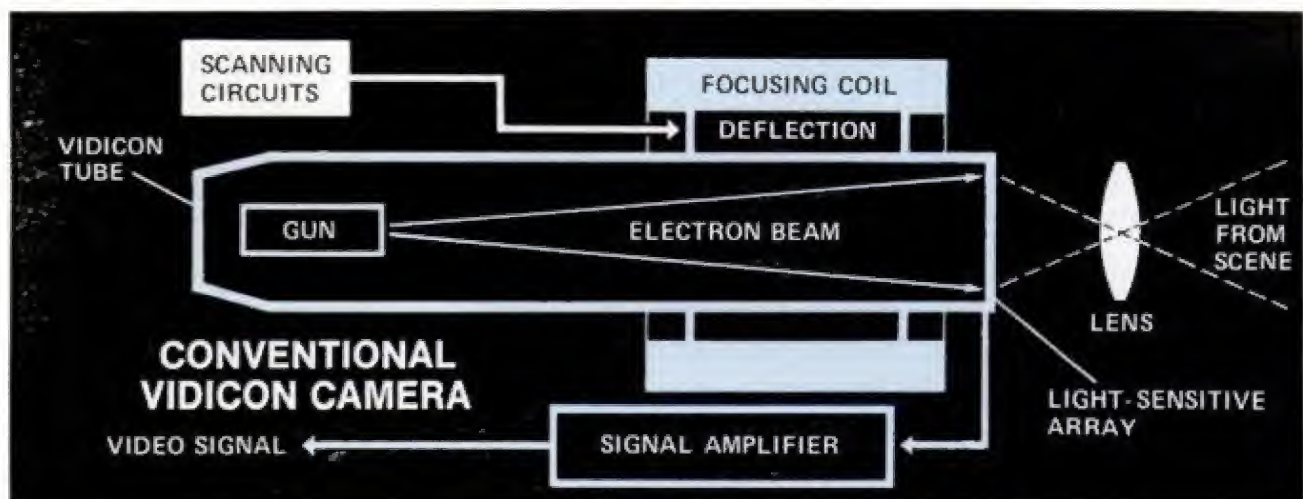
Even vidicon cameras have been shrinking lately. Some of them, using solid-state devices for everything but the camera tube, are about as small as Super-8 home movie cameras.

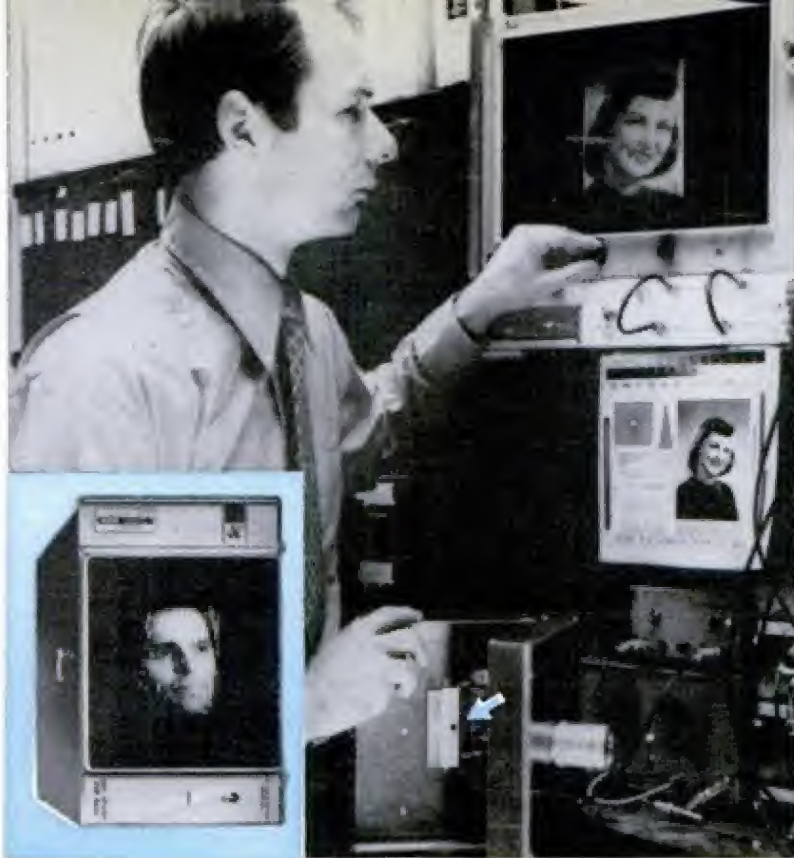
But the new image sensors, requiring no space-consuming electron beam and gun, no bulky deflection and focusing coils, will make cameras smaller still. A single, semiconductor wafer only millimeters thick will hold the camera's "tube" and all its circuitry—just a lens and peep sight will make the camera complete. Such cameras will share the usual solid-state advantages of greater reliability and rug-

gedness, lower power drain, less dangerous voltages and, ultimately, lower cost and better performance.

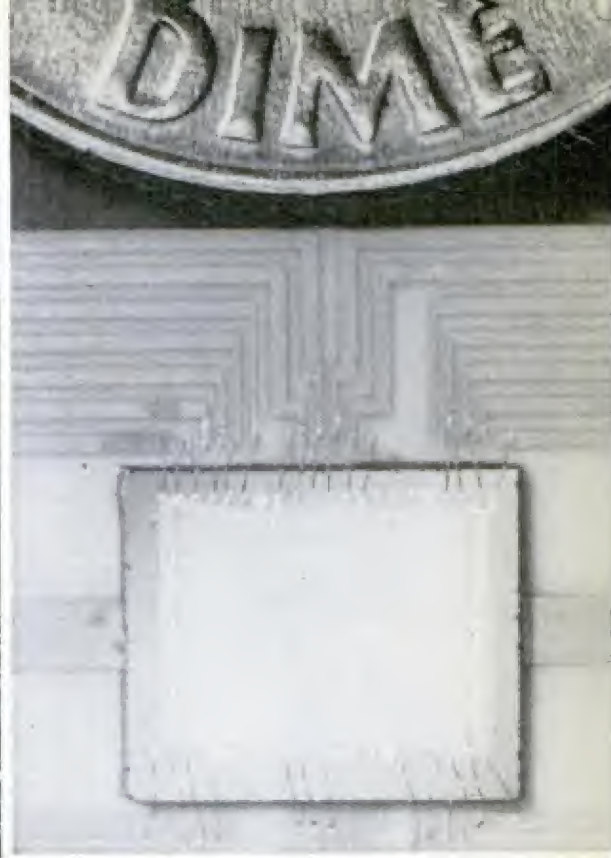
So far, though, performance is nothing to shout about. When RCA announced its "bucket-brigade charge-transfer" camera prototype (so-called because charges are passed from one sensor element to the next), the major excitement stemmed from the camera's size ($2 \times 2\frac{1}{4} \times 2\frac{3}{4}$ inches), not its performance. With only 32 rows of 44 sensing elements (1408 total), the picture was far cruder than that of a TV vidicon camera, with nearly 400,000 picture elements.

Within weeks of RCA's announcement, Bell Laboratories showed a silicon-chip camera based on "charge-coupling" techniques—less efficient, so far, than RCA's bucket-brigade technology, but simpler to



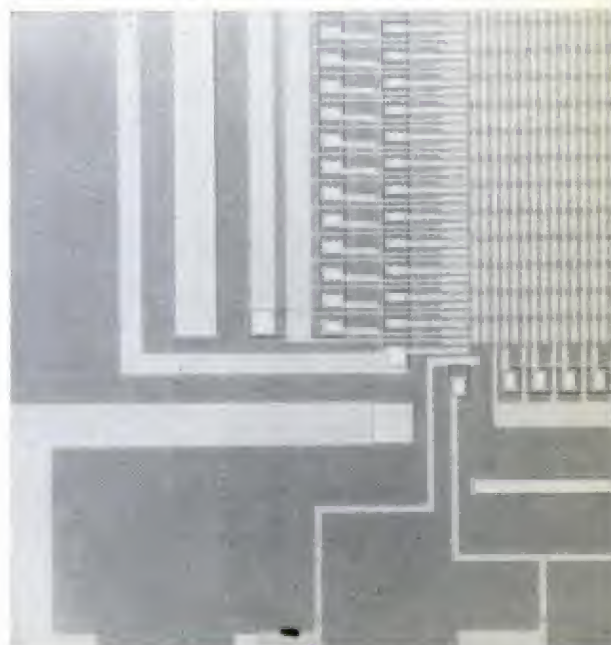
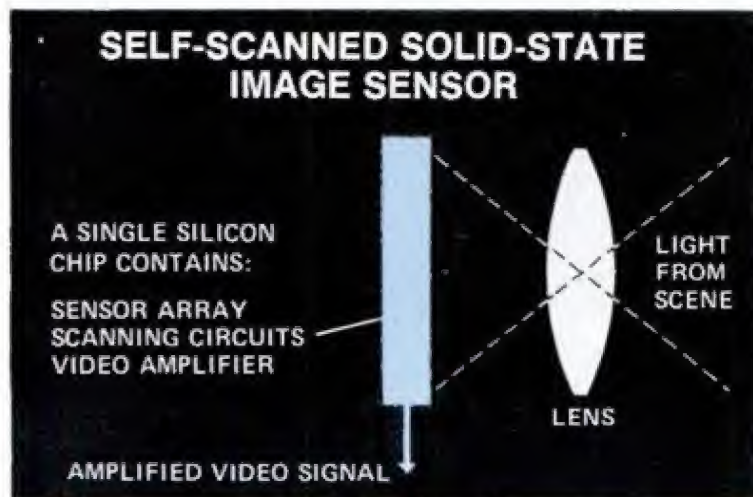


RCA'S SOLID-STATE TV CAMERA PROTOTYPE (facing page) is the smallest yet and could be made smaller. So could Bell Labs' prototype (above)—note all the empty space in its cabinet. The Bell Labs' chip, with more than 13,500 light-imaging spots, gives a more detailed image than RCA's 1408-spot version (inset, above), even though only half of the Bell chip's area is used for imaging and half for storage (right). Enlarged seven times, the chip's small size is obvious next to a dime; RCA's chip is about 13 percent smaller. Chip's complexity shows up in the 90X detail enlargement appearing at lower right



make, and requiring less external circuitry. Bell's chip had 13,568 elements, nearly 10 times as many as RCA's. But because half its elements are used to store the image information till it can be transferred out, Bell's chip is effectively only five times as sharp and detailed as RCA's.

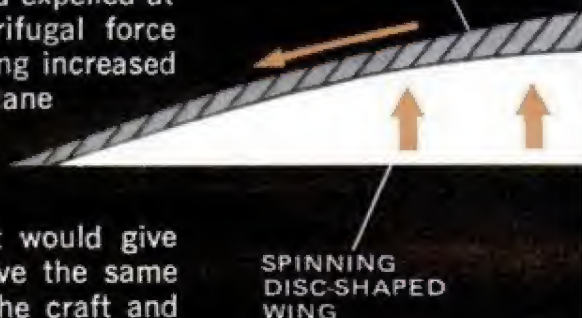
Meanwhile, if you want to build your own wrist TV camera, Reticon, in California, has a 1024-element chip available that uses a more complex "X-Y-addressed, switched-photo-diode" technique. The price? Just \$600 per chip. ★★



Coming: A 'flying saucer'

THERE MAY BE NO SUCH THING as flying saucers from outer space, but that doesn't mean you won't be seeing them in the skies if Australian inventor Duan Phillips has his way. Phillips has come up with a saucer-shaped flying disc that lands and takes off vertically like a helicopter, but is said to have seven times the lift of a conventional copter. The disc is spun like a top by a centrally mounted engine. At the same time, air is drawn in by a blower and expelled at high pressure across the disc's upper surface. Centrifugal force created by the spinning motion accelerates the air, adding increased speed to the flow. The effect is similar to that of an airplane wing flying through air at high speed. The rapid flow of air over the curved surface of the disc produces a low-pressure area above the saucer, providing tremendous lift. A separate steerable air jet would give forward thrust, control direction of movement and serve the same function as the tail rotor on a helicopter to stabilize the craft and keep the central portion from turning with the disc. Passengers and crew would ride in a circular bubble-like canopy on top of the disc. The spinning saucer would have the natural stability of a gyroscope and be virtually crashproof. Even if the engine failed, the flywheel action of the coasting disc would continue to supply sufficient lift for a safe glide back to earth.

AIR FLOWS OVER WING AT HIGH SPEED, CREATING LOW PRESSURE AREA THAT PROVIDES UPWARD LIFT



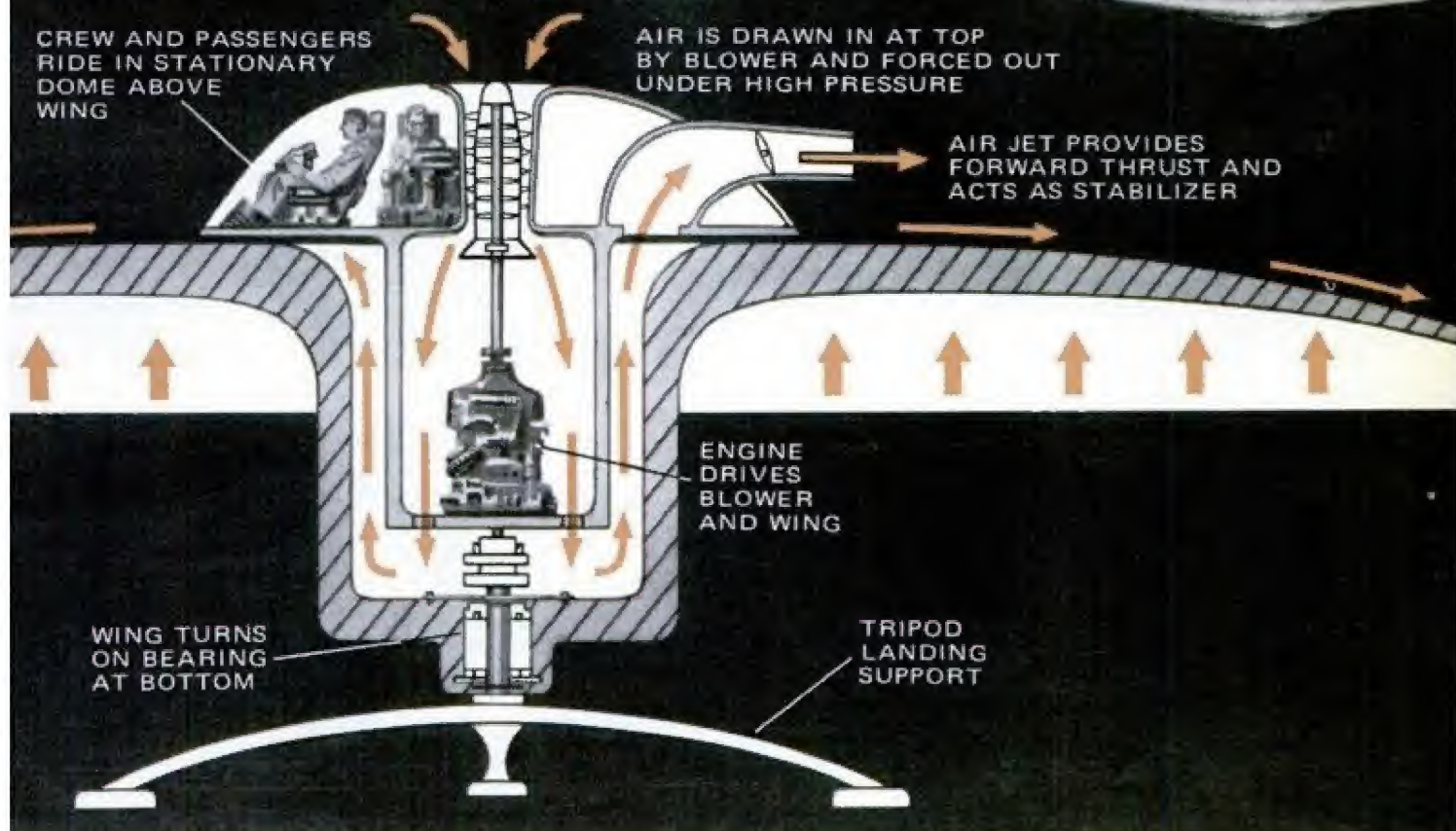
SPINNING DISC-SHAPED WING



Now: water skis with hydrofoils

If plain old water skiing isn't thrilling enough for you, you can now do it on hydrofoils. The foils, made to clamp on regular water skis, raise the skis off the surface and permit such exciting acrobatics as diving, climbing, making sharply banked turns and bobbing like a porpoise. They also reduce water drag, enabling you to go faster on less power. They come in several lengths depending on how high you dare "fly" and range in cost from \$50 to \$75. Available from Custom Dynamics, Inc., 119 River St., Waltham, Mass.

that really flies



Rent-a-hull for house trailers

You could vacation on land or water with this convertible house trailer. When you reach a lake or river, you just drive into a special rent-a-hull marina, a crane drops your trailer into a waiting catamaran, and you're off in your own houseboat. The trailer is designed so its body lifts easily off the underframe and wheels and fits into a matching cutout in the catamaran's deck. It's the idea of Danish inventors Leif Smitt and Ole Svendsen.

AUGUST 1972

105



PM SAAB 99 OWNERS REPORT...

A nationwide survey based on
1,400,000 owner-driven miles



Best car to save your skin, but steering takes too much muscle!

By MICHAEL LAMM, West Coast Editor / Photos by Irv Dolin

PEOPLE WHO BUY SAABS don't do it on impulse. It's a car chock full of safety and engineering features that owners tell us they've evaluated carefully before deciding to buy. More and more have been making the decision since the 99 was introduced here in 1969 (see *Saab's New 99*, page 42, July '69 PM).

Even then, the 99 had many advanced features, but it's much more car today. It's called the 99E, the E for the Swedish word for fuel injection. Displacement of the overhead-cam Four engine is up to 1.85 liters.

The 5-mph bumpers and heated driver's seat are '72 additions to the impressive basics of the car: front-wheel drive, roll-cage unit body, dual-diagonal braking system with four-wheel power discs, radial tires, rack-and-pinion steering and *real* aerodynamic design.

Sensible design, in fact, kept popping up

all over our owner survey. A surprising 32.2 percent chose this car for its front drive, and another 20.2 percent listed *safety* as their prime reason for buying. No other owner group we've questioned has ever ranked safety nearly this high. To let some of the owners tell how they felt about it:

"Front-wheel drive gets me around in all types of weather, safely, because there's no skidding and no loss of traction." "Triple-safe diagonal disc braking system is the best, and fwd gives Saab superior handling." "Very good stability in crosswinds with fwd and weight up front." "I bought the car because I feel it is the safest and one of the best all-around small touring sedans made." "We feel very safe in it." "Sturdy roll-cage body, fwd for handling, four disc brakes for stopping, good size for maneuvering and parking, plus a lot of no-cost conveniences like the

fold-down rear seat, reclining front seats, heated driver's seat, fuel injection for better mileage; in short, what more could a person ask for?"

What more do owners like about their Saabs?

"Excellent vision, hugs the road and curves with a noticeable difference (fwd), and the defrosting system is excellent since it defogs the side windows, too." "I have gotten 25.1 mpg twice on 70-80-mph highway trips." "It is solidly put together. Compared with other new cars I've bought, it's tremendous." "Smoothness of fuel injection over carbureted engine—I pick up customers at the airport 40 miles away, and they usually ask me if it's a Six."

What do Saab owners think of their cars' workmanship?

"As good as my Volvo and better than any American car I've owned." Our questionnaire showed that 88.0 percent of the owners rated the Saab's workmanship as good to excellent, with 36.4 percent giving it a straight *excellent*. That's well above the norm.

We also put in a question that asked whether Saab owners have ever been in accidents with their cars. Some 85 percent

hadn't, but the rest told some pretty hair-raising tales:

"I was driving 80 mph," recounts a Massachusetts retiree, "and fell asleep for a moment, and when I woke up I was on the tail of a car doing 45 mph. I pulled hard left, rolled over 10 times, skidded, but got out of the car without a scratch, thanks to the shoulder harness. Now there's no other car I'll ride in."

A Pennsylvania vice-president recalls, "Saab talks about its roll-cage construction. In Nov. 1971, on Interstate 81, I had to swerve my Saab to avoid a skidding car. My car spun sideways and backward 100 yards, snapping off a heavy steel snow guard on the highway. Two wheels were bent into an S shape. Impact was just behind the front door. Damage to car; \$970. Penetration into passenger compartment: none. Injuries: none."

Owners who had minor accidents indicated that the bumpers performed well. Exception was about one-fifth of these respondents who collided with objects or cars with bumpers not at the same height as the Saab's! Result was a run on new front grilles for the car. (PM's test car, in fact, received this treatment while it was parked at the curb in New York City—

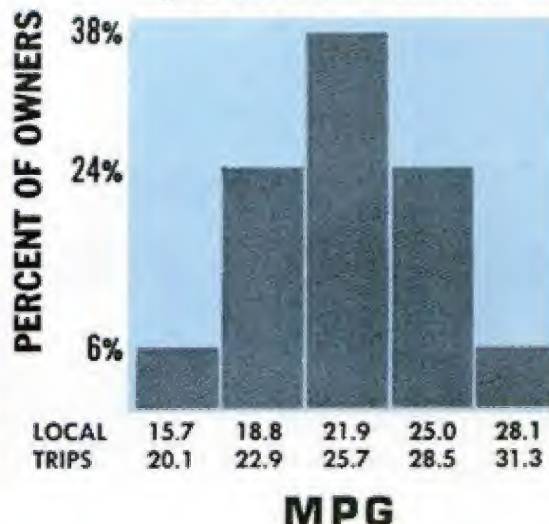


ENERGY-ABSORBING BUMPER of cellular plastic will take genuine 5-mph barrier impacts in stride, but the lack of uprights leaves the grille vulnerable

RADIAL TIRES (below, left) are standard on the 99, and mud flaps keep tires from spattering underside



SAAB 99 FUEL-MILEAGE CHART



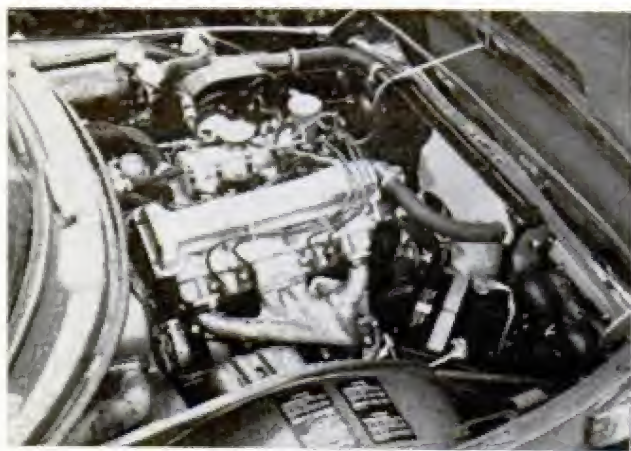


NEW OFFERING is an electrically heated front seat. Seatbacks fold down; headrests allow good vision, as do the tall windows. Pedals are offset to center

the victim of a sloppy hit-and-run parker who bashed the grille!)

What do Saab owners think about their dealers?

The comment heard most often is that there aren't enough dealers. Several owners complained of having to drive 60-75 miles to the nearest dealer. Concentration is still thickest in the East. Other than that: "Exceptional service, and on two



FUEL INJECTION and single overhead cam give the 1854-cc (113.1-cu.-in.) Four its 95 hp at 5200 rpm. Still, enthusiastic owners would like even more go



occasions my dealer lent me a car while mine was in the shop." Mechanics seem inexperienced at servicing fuel-injection system." "I deal with a smaller dealer—owner is the only salesman and head mechanic all in one; very friendly, courteous, helpful."

What changes would Saab drivers like to see?

"Larger engine if it doesn't affect fuel economy." "Power assist on steering." On this score, two owners mentioned receiving questionnaires from the factory asking whether the Saab's steering effort is too high. This same factory questionnaire asked if owners would appreciate higher horsepower. Both owners concluded that Saab must be considering improvements in both areas. Indeed, a two-liter "EMS" version is for sale in Sweden and will surely be exported to the United States, and a power-steering unit is in the research and development stage now.

How about general comfort?

Says a New Hampshire technical writer: "I find the Saab very comfortable, as do my passengers; also the ride is surprisingly smooth, even with Koni shocks and 30 psi in the radials." And a Colorado contractor: "Comfort is one of the Saab's outstanding features, both front and rear." And, "Never any crowding or squeezing. There's even room in back for three." On the other hand, "Seems they could make a \$4000 car quieter." "Inertia reels on front lap/shoulder belts are comfortable and easy-to-use," says a retired New York driver.

With praise running thick and fast, an amazing 95.0 percent stated they'd buy another Saab; 14.6 percent, in fact, did, owning two at the same time. And a significant number had owned Saabs previously, one man in Vermont saying this was his seventh in 11 years.

What, though, didn't owners like about their cars?

"Hollow headrests." (Push-in plugs are available, but the idea of the hollowness is to aid rear vision.) "Don't like the door locks. If you lock them from inside, you

SPARE IS UPRIGHT at far rear, so deep trunk holds a surprising amount. Beam rear axle means flat trunk floor. Trunk opens to car when rear seat is folded

POPULAR MECHANICS



FRONT DRIVE gives superior traction in wet or on snow. The entire car is designed with safety first

COMFORT FOR PASSENGERS and driver is impressive. Saab is compact outside, but very spacious inside

can't unlock them from the outside. Also, they freeze easily." "Too boxy looking and too expensive for its size and power." "My wife would like power steering." "Wind noise, stiff shifting." "Flow-through vent system doesn't give enough air." "Not enough dealers." "Paint chips easily." "Needs a bigger gas tank."

Parting shots sound like something written by Saab-Scandia's advertising people, but they're not. The following are typical:

"For the size of the car, seating, riding comfort and fuel economy, there is no domestic auto to my knowledge that compares with the Saab."—New York inspector.

"I drive about 35,000 miles a year, am a salesman covering Massachusetts, Vermont and New Hampshire. I truly believe Saab is the safest car to drive, especially in snow. It's economical, fun, rugged and safe. I've owned two before this one, and all have been great." ★★★

Summary of 1972 Saab 99 Owners Reports*

Total miles driven1,430,692

Average miles per gallon

Local driving21.9
Long trips25.7

Transmissions:

Automatic38.8%
4-speed manual61.2

Body styles:

2-door sedan55.9%
4-door sedan44.1

Why the Saab?

Front-wheel drive32.2%
Safety features20.2
Economy16.5
Handling13.9
Styling13.5
Past experience12.7
Quality11.2

Specific likes:

Handling47.2%
Comfort39.8
Economy27.1
Styling13.8
Roadability13.4
Ride12.3
Performance10.4

Specific dislikes:

Rattles13.4%
Door locks9.5
Poor dealer service9.5
Hard to steer8.0
Lack of power5.7

Have you had any accidents?

No84.6%
Yes15.4

Do the impact-absorbing bumpers do their job?

Yes81.1%
No18.9

What changes would you like to see?

More power20.4%
Power steering19.6
Better door locks5.0
Fewer rattles4.6
Tach as standard4.6

Had any mechanical trouble?

Yes50.5%
No49.5

What kind of trouble?

Electrical13.8%
Transmission12.3
Oil leaks11.6

Speedometer cable9.4
Fuel-injector leaks7.3

Did you repair it yourself?

No92.0%
Yes8.0

Dealer repairs satisfactory?

Yes68.9%
No31.1

Is the Saab your only car?

No55.3%
Yes44.7

Other cars owned:

Volkswagen15.9%
Another Saab14.6
Ford12.6
Chevrolet8.6
Volvo8.0
Pontiac6.6

Age distribution of owners:

15-29 years28.2%
30-49 years37.9
50-plus33.9

Would you buy another Saab?

Yes95.0%
No5.0

*Percentages might not equal 100% due to rounding and/or insufficient data.

NEWS BRIEFS



Think chess is difficult? Try it on a sphere!

"Global Chess" (left), a sphere fitted with 64 magnets to hold pieces in place, is the most perfect form of 3-D chess, according to inventor Peter Yaspan. At right, he demon-

strates another 3-D form, Spherical Chess. In the foreground is his rounded chess board. All three new forms, he says, increase the number of strategies, tactics and moves.



First European airbus nears completion

Scheduled for first flight tests this year, the A.300B European airbus is shown during con-

struction at Toulouse, France. It'll be powered by General Electric engines.

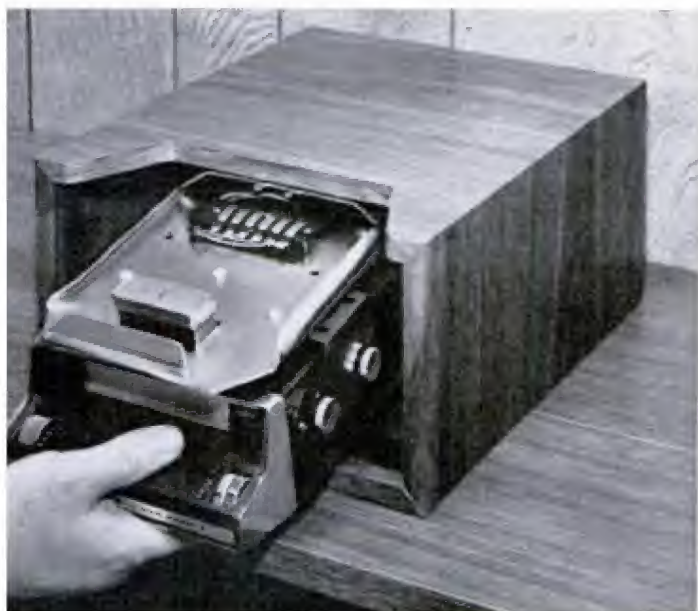
Slip it in— slide it out



SLID INTO UNDER-DASH MOUNT, tape deck automatically connects to car's wiring, ready to play



TO PLAY TAPES AT HOME, slip deck out of car (above) and into a matching mount in house (below)



Handy slide mounts with pre-wired contacts make it easy to enjoy your tape deck or radio in your car, boat and at home—and keep it from being stolen in the bargain

By **SHELDON M. GALLAGER**

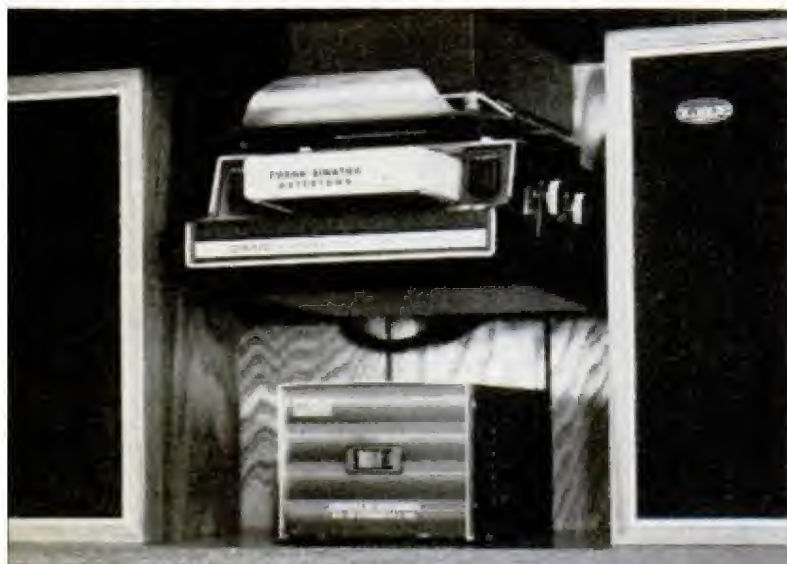
Photos by Robert D. Borst

THAT SHINY STEREO tape player hanging smartly below your car's dashboard is an eye-catching accessory—so eye-catching, in fact, that it's been catching the eyes of thieves all over the country. So many tape decks are stolen from cars every day that insurance companies no longer cover their loss. Nor will they cover the damage done to your car in breaking in to get at the deck, such as smashed windows and pried-open doors. As a result, a stolen tape deck not only means the loss of valuable equipment, but it can run up a steep repair bill as well.

The answer is a nifty little device called a quick-disconnect slide mount. With this clever piece of hardware, you can have your cake and eat it, too. You can enjoy stereo tapes while traveling, yet be reasonably safe from theft at the same time. The mount consists of two mating pieces—a metal track that installs permanently in your car and a matching



THREE SETUPS for playing car tapes at home are shown at left. Top photo shows ready-made enclosure by Kustom Kreations. Attractive walnut-finished cabinet contains a slide mount and 12-volt power supply for operating car-type tape decks on house current. Price, without speakers, is about \$35. Similar unit with built-in speakers is about \$50. Two center photos show simple homemade arrangement in which tape deck is suspended below bookshelf. It's necessary to mount slide plate on spacer block—a short length of two-by-six—to provide sufficient clearance for tape deck to slip in and out. Separate 12-volt power supply is also needed, here an Audiotex model priced at about \$26. Bottom photo shows still another possibility. It's a 12-volt power supply fitted with a slide bracket that mates with mounting plate on the tape deck. You just slide power supply onto deck, hook up two speakers and you're in business. About \$20 from Kustom Kreations



flanged slide that attaches to your tape player. The slide slips onto the track to hold the tape deck in place while you're on the road. When you leave your car, you just slide the deck out and take it in the house or lock it in your trunk. The absence of that tempting sight dangling beneath your dashboard deters thieves from attempting to break in.

What makes the slide mount so ingenious is that there are no wires to connect or disconnect every time you slide the tape deck in or out. Each half of the mount contains identical wiper-type, spring-metal contact strips. As the two parts come together, the contact strips engage each other, automatically connecting your tape player to your car. Contacts on the dash-mounted track plate are wired to the car's 12-volt electrical supply and speaker connections. Contacts on the tape deck are similarly wired to matching connections on the player. When you remove the deck from the car, the connections are neatly broken without any wires to undo.

There are advantages to the system beyond preventing theft, too. By installing duplicate mounting plates in a second car, boat, camper, motor home or other vehicle, you can quickly switch your tape player from one to the other as needed, making a single unit serve a variety of uses. You can even play your stereo tapes at home by connecting the deck to a 12-volt converter that will enable it to operate on house current. Home conversion units are available ready-made for this purpose, including a built-in 12-volt power supply and some with built-in stereo speakers as well. Or you can rig up your own home mount



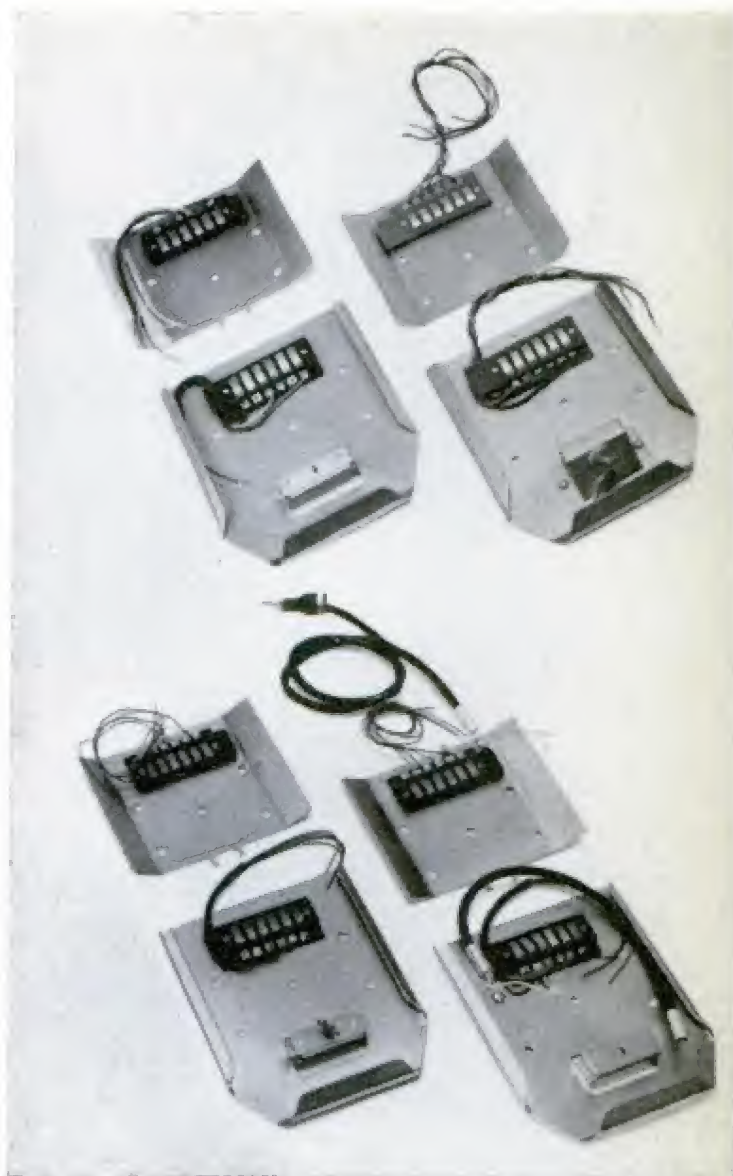
BASICALLY SIMILAR, slide-mount sets are made by a variety of manufacturers, as shown in photo at upper right. Each set consists of two parts—a base plate that mounts permanently in car or home and a flanged piece that attaches to tape deck and slides onto the base plate. As the two parts come together, spring-metal contact strips engage each other, making electrical connections automatically. Special set at lower right, made by Kustom Kreations, is designed for use with a radio and has extra shielded cable to permit mount to be connected to car's antenna. Two bottom photos show several types of floor mounts that straddle the car's transmission hump—useful where under-dash space is limited. In this case, slide bracket is bolted to underside of hump mount and tape deck hangs in U-shaped opening above car's floor. Mounts come in black or chrome, range in price from about \$9 to \$12. They're sold by Kustom Kreations, Audiotex and Myler Enterprises

by attaching a bracket to a shelf, bookcase or other enclosure, as shown in the accompanying photos.

The interchangeable slides can also be used for quickly removable mounting of other electronic equipment, such as an FM radio, CB transceiver or shortwave set. All of these require basically the same electrical connections as a tape player—a source of 12-volt power and hookup to speakers. For radios, special brackets are available that include, in addition to the standard contacts, an extra shielded cable that permits the mount to be wired to a car or boat antenna. Dual connectors on these cables make it possible to tap the antenna line without affecting reception on an existing radio.

Though basically similar in function, slide mounts come in a variety of styles and are readily available at hardware stores, auto-supply dealers, discount centers and electronics mail-order houses such as Lafayette Radio. Among the major makers are Kustom Kreations, Inc., 19316 Londelius St., Northridge, Calif. 91324; Myler Enterprises, Box 2911, Van Nuys, Calif. 91404; Boman Astrosonix, 225 West Commercial Ave., Moonachie, N. J. 07074; and Audiotex, a division of GC Electronics, 400 South Wyman St., Rockford, Ill. 61101. If you should have difficulty locating a particular mount, write the manufacturers listed above for further information.

The mounts are generally sold in packaged sets—track plate and matching slide—and run around \$7 to \$10 per pair. Those with FM antenna leads for radio use cost a bit more—about \$13 per set. Extra track plates are also available separately so you can use one slide mount





MINI-MOUNTS work in same way as regular slide mounts, but are smaller—ideal for use in sports cars and subcompacts where there is often little under-dash space. They can be used either as hump mount (top photo at left), or side flanges can be removed, as shown in bottom photo, and the slide fastened underneath dash in conventional manner. For hump mounting, hanger bracket on tape player is turned upside down and slide is bolted to bottom of the player (center photo). To fit slide to hanger, it's usually necessary to use four small off-set bracket arms, as shown. Photos show an 8-track Craig deck on mini-mount made by Kustom Kreations

in several locations. The track plates mount under the dashboard in the same way as the hanger bracket on the tape deck itself—usually with sheet-metal screws up into the lip on the underside of the instrument panel. The slide part of the mount is then attached to the deck's hanger bracket with machine screws.

For cars with limited under-dash space, or where you can't easily find a surface to attach to, there are floor-mount adapters that eliminate the need for dashboard mounting. These are U-shaped metal housings that fit over the car's transmission hump and support the tape deck or radio a few inches off the floor. Such hump mounts are handy and sporty-looking, their only limitation being that they can't be used in many cars with floor-mounted stick shifts. A smaller version of the standard slide mount is a "mini-mount" made by Kustom Kreations. This, too, is available in both under-dash and floor-mount styles and is helpful in making installations in some sports cars and subcompacts where under-dash space is tight.

One nice thing about slide mounts is that they provide six electrical contact strips—an ample number for virtually any electronic equipment you may want to install. Generally, only four are used—one for the hot power lead, one for a ground connection and one each for the two stereo speakers. This leaves two spare contacts that may come in handy for future use. One of the two, for instance, can provide an antenna connection if you decide to switch from tape to radio or if your tape player already incorporates a radio, as many more recent models do. The extra contacts can also be used to feed two additional speakers if you go in for one of the newer four-channel, quadraphonic-type tape players.

The contacts come prewired with color-coded leads that follow the color coding

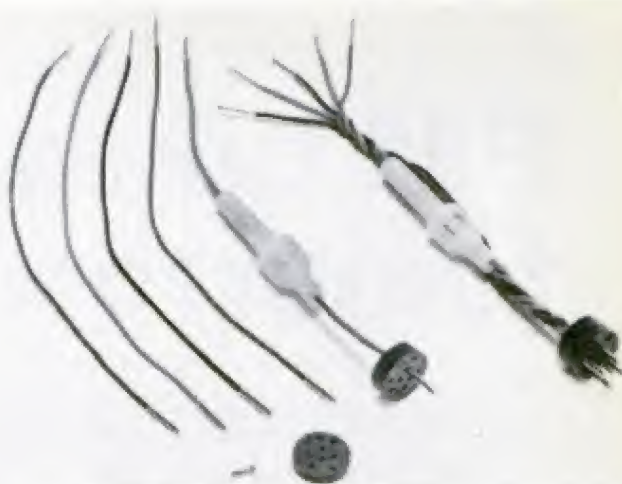
TYPICAL WIRING SEQUENCE is shown at right, using universal connector that comes as a kit. Kit (top photo) has interchangeable pins that can be arranged to form plug that will fit just about any stereo tape player on the market. Wires are color-coded and include a fuse holder in hot power lead. After plug is assembled, connector's leads are soldered to those coming from slide mount (second photo from top). Soldered joints are then taped, slide mount is bolted to player, and connector is plugged into player's cable. Photo at bottom shows how slide mount can be used to hold a radio as well as tape deck—in this case, a Heathkit CB transceiver

used by most tape-deck manufacturers to make hookup easy. The leads coming from the dash-mounted track plate are wired permanently into the car's electrical system. If you have a tape deck already installed, use the existing wiring to save making new connections. Simply cut the cable a few inches from the tape deck and splice the wire ends to the matching-color leads from the bracket on the dash. If you should find five wires coming from the mount instead of four, the fifth wire is for grounding your speakers separately from the power ground. However, most mounts use only four wires, combining speaker ground and power ground in one lead.

Most car stereos have a plug and jack connector in the wiring harness. When you cut the cable, save the plug with a few inches of wire left attached to it. The short wires from the plug are spliced to the leads coming from the slide mount attached to the tape deck, using the same color-matching procedure as for the dash mount. The plug can then be inserted in the jack on the tape deck to complete the hookup without disturbing the original quick-release connector. This makes it easy to disconnect the tape deck from the slide mount if you should decide to remove it later—you just unplug it.

If, for any reason, you should lose or don't have a plug to fit your tape deck, universal adapter plugs can be purchased in kit form from the same dealers that stock slide mounts. Pins on these can be arranged to match the pin patterns used by all major tape-deck manufacturers. You simply make up the appropriate pin arrangement, wire the plug to the slide mount, and you're ready to play stereo tapes anywhere. For home use, 12-volt converters are available from Kustom Kreations, Boman Astrosonix, Audiotex and most local radio-parts stores. ★★★

AUGUST 1972



PM takes a ride in tomorrow's bus today!

Ever been stuck behind a bus? Then you know what a smelly, unhealthy experience it is. Not so behind Lear's

By JOHN ETHRIDGE

A STEAM-DRIVEN TURBINE is the powerplant of the future, the way Bill Lear sees it. His steam-powered bus uses the same basic system intended for the firm's passenger-car project, a Monte Carlo sedan (see *A Look Under the Hoods of Tomorrow's Cars*, page 98, June '71 PM). The single-stage turbine powerplant is designed to put out 220 hp and propel the 17-ton (fully loaded) GMC coach to a top speed of 55 mph and negotiate a 19 percent grade at 5 mph, performance comparable to diesel-powered versions.

Preliminary to the first demonstration of the bus at Lear's plant near Reno, it was announced that the working fluid in the system was now "Learium III," which Bill Lear went on to say "... mixes well with scotch." The earlier fluorinated hydrocarbon "Leariums" were discovered to be not nearly so inert as hoped and changed into honey-like substances that clogged up the condenser. Consequently, for the time being at least, they switched back to the old standby, water! Other than an electric tach for the turbine redlined at 60,000 rpm, driver instruments and controls appear about the same as on an ordinary bus.

Start-up was accompanied by a whirl of the centrifugal fan that supplies combustion air to the vapor generator (boiler) and various noises of pumps and other auxiliary equipment. In approximately a minute from the time the starter button was actuated, the bus was under way.



READY TO ROLL in its first demonstration is Bill Lear's

Each time the bus started from rest there was a jerk followed by slow acceleration about like you'd expect if you popped the clutch on a conventional vehicle with the transmission in one of the higher gears. This, it was explained, was due to the automatic transmission not matching the turbine characteristics, which is quite plausible and should be easily cured by raising the stall speed of the torque converter.

Once under way, the power transmission is smooth and the noise from the engine compartment is such that no one would suspect anything unusual. No gear whine is distinguishable above that of the fans, pumps and the like.

Specifications for the vapor generator were given as 2400 pounds of steam per hour at 900 p.s.i. (absolute) at 950° F. No flat-out runs were demonstrated. The maximum observed speed was approximately 32 mph, at which the turbine inlet pressure and temperature were 650 p.s.i. and 600° F. approximately. The bus continued to trundle guest riders back and forth for over two hours without a hitch or in-



steam bus. It's being tested and evaluated by the State of California for future commercial service

interruption, an altogether satisfactory demonstration.

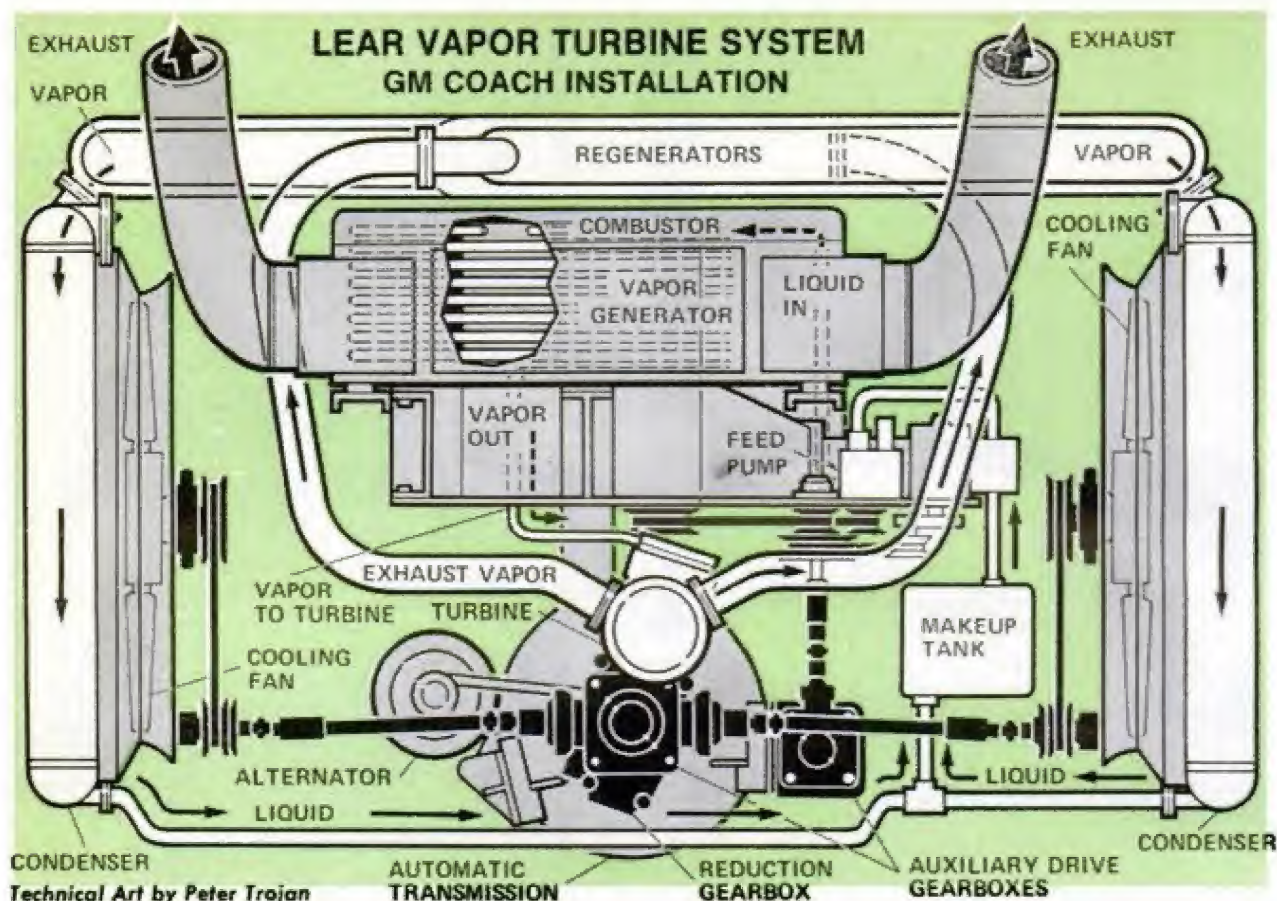
The Lear bus, one of three steam buses the state of California is having built under a federally funded demonstration project, will undergo a 60-day stint in passenger service in San Francisco after final testing by Lear.

Lear's avowed objective is to come up with a vapor turbine prime mover that meets or beats the conventional automotive engine in the areas of cost of manufacture, weight, size, durability, fuel economy and emissions. In most of these he still has a way to go, but the emissions picture is a rosy one indeed. If field tests by others confirm Lear's own lab results, the kerosene-burning vapor generator already exceeds by a comfortable margin the most stringent proposed federal or California emissions standards. This, of course, is a battle that must be won, or else victories in the other areas would be meaningless.

The combustion section and the turbine itself have been comparatively easy to develop and are farther advanced than some other system components. Ungla-



JUST ADD WATER to the regenerative system. The search goes on, however, for a better fluid to use



VAPOR-TURBINE SYSTEM shown as it appears in rear engine compartment of GMC coach used by Lear

morous parts such as variable displacement pumps, fans, blowers and controls have taken an unanticipated toll of money, manpower and time because nearly all of these had to be developed from scratch when suitable off-the-shelf components could not be found.

A major remaining task is paring off weight and reducing the size of the system so that it will fit under the hood of a passenger car. Lear engineers think they may be able to come up with a more compact vapor generator, and by rearranging other components, make room for the large condenser required. There's plenty of room in the engine compartment of the bus for the system as it is now, but space under the hood of the Monte Carlo is at a premium with practically the whole frontal area of the car below the windshield being occupied by a huge condenser and fan shroud.

And the search for a working fluid with better characteristics than water will doubtless continue. First of all, a fluid with heavier molecules than water would permit lower turbine speeds which would reduce stresses on the turbine wheel. This would, in turn, allow higher working temperatures which give greater efficiency

(less fuel consumption for a given power output).

Another limitation of water is that not much heat energy can be added to the vapor above about 700° F. without also going to extremely high pressures. For maximum efficiency, heat should be added at the highest possible temperature. The highest possible temperature is determined by the strength of materials used which, in the case of the nonexotic Lear turbine, is between 1100° and 1200° F. Thus with water as a working fluid, taking full advantage of the metallurgical limit cannot be done because high pressures and high temperatures cannot be tolerated simultaneously. (Some modern stationary turbines operate in the so-called *super-critical* region of 1000° F. and 3800 p.s.i., but it is doubtful if the design can be adapted economically to automotive application.)

Steam engineers have long understood the above problem and have been wishing for a Learium for three-quarters of a century. They've even gone so far as to plot the characteristics of ideal Rankine (steam cycle) working substances in textbooks. One calls for a fluid that requires

(Please turn to page 176)

Don't let those brownouts become burnouts

This easily built current checker lets out a loud warning squawk if your line voltage falls below a safe limit for motor-driven home appliances

By RUDOLF F. GRAF and
GEORGE J. WHALEN

Photos by Robert D. Borst

WHEN A BROWNOUT OCCURS, your lights go dim, the picture on your television screen shrinks, and your electric coffee percolator takes a little longer than usual to perk. You tend to shrug—just the power company cutting back the voltage a bit to conserve juice on a hot day. No harm done. Other things are happening, however, that can cause harm.

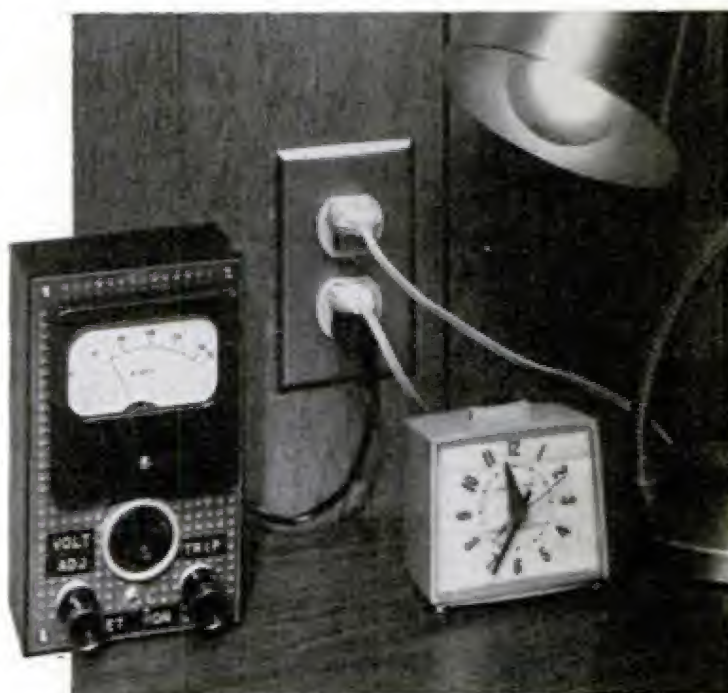
Induction motors must operate at or near their rated voltage or they're in for trouble. A drop of only 10 percent in line voltage can cause running torque to decrease 19 percent, slip to increase 23 percent, current draw to jump 11 percent and temperature to rise 12° to 15° F. Maximum overload capacity decreases 19 percent. What happens is that the motor, struggling to operate on the reduced voltage, draws excessive current in an attempt to compensate for the loss of power. If the voltage drops too low, intense heat builds up and the motor can

AUGUST 1972

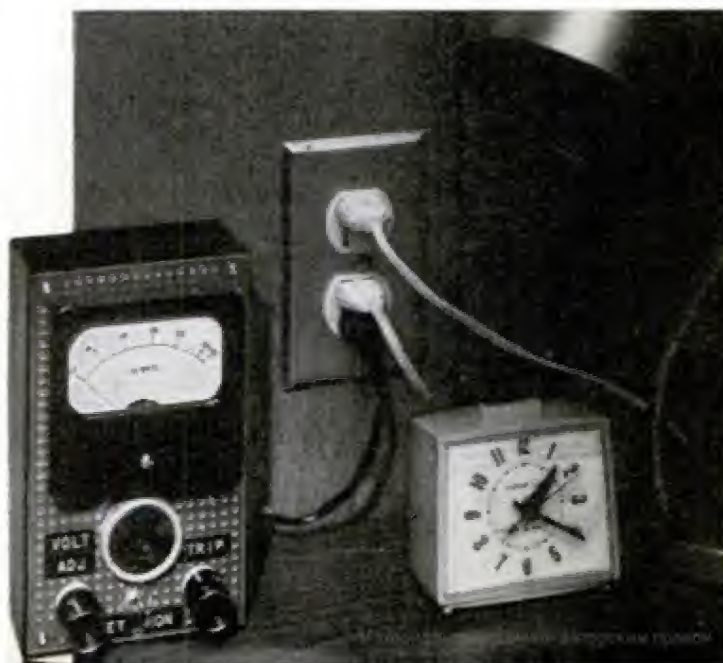
119

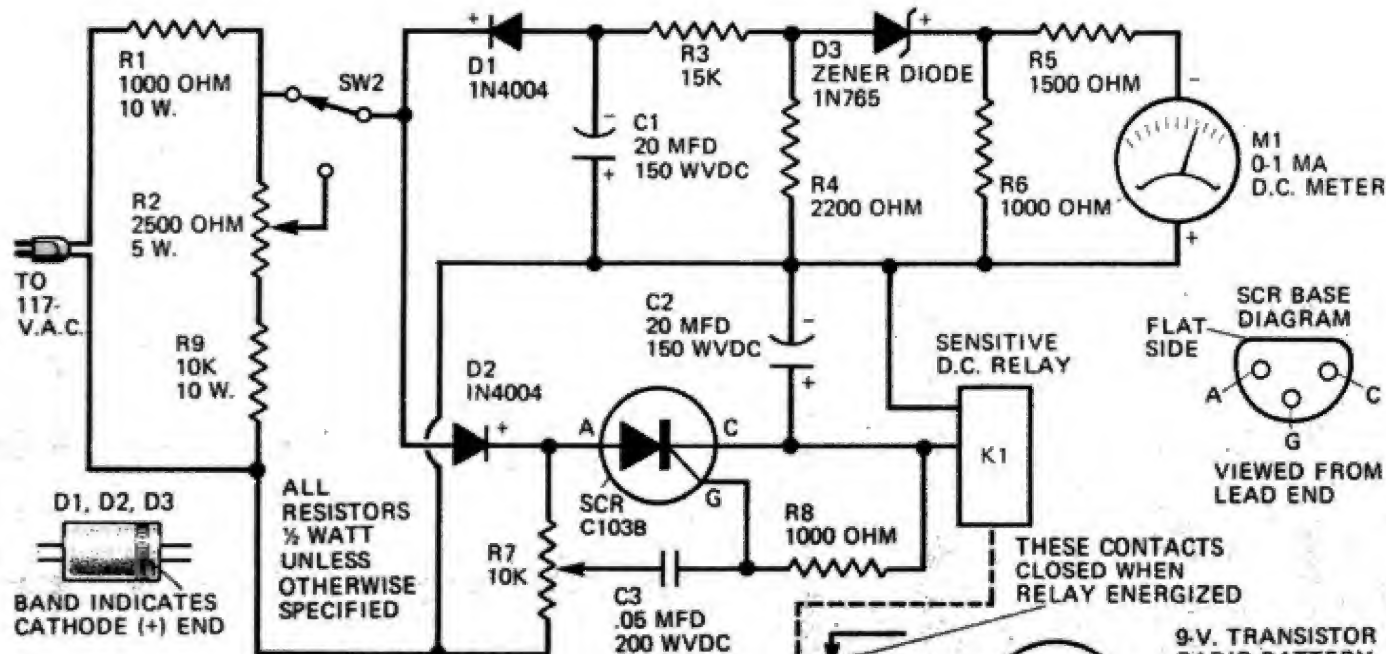


ALL'S WELL—meter reads normal line voltage



WHOOOPS! LIGHTS DIM, meter needle falls and warning beep sounds to indicate drop in voltage (above). Blackout (below) also trips alarm





PARTS LIST

- D1, D2—General-purpose silicon rectifier diode, 400 PRV, 1-amp. rating, (type 1N4004 or HEP 157)
 D3—Silicon zener regulator diode, 0.25-w., 10-v. (type 1N765 or HEP Z101)
 SCR—Silicon-controlled rectifier, 200-v., 0.8-amp. rating (General Electric C103B)
 C1, C2—20-mfd., 150 WVDC miniature electrolytic capacitor
 C3—.05-mfd., 200-v. mylar capacitor
 R1—1000-ohm, 10-w. wirewound resistor (Lafayette Radio 33R46301)
 R2—2500-ohm, 5-w. wirewound potentiometer (Lafayette Radio 33R13525)
 R3—15K, 1/2-w. composition resistor $\pm 5\%$ (Lafayette Radio 52R8101)
 R4—2200-ohm, 1/2-w. composition resistor $\pm 5\%$ (Lafayette Radio 52R8081)
 R5—1500-ohm, 1/2-w. composition resistor $\pm 5\%$ (Lafayette Radio 52R8077)
 R6—1000-ohm, 1/2-w. composition resistor $\pm 5\%$ (Lafayette Radio 52R8073)
 R7—10K, 1/2-w. linear taper potentiometer (Lafayette Radio 33R11255)
 R8—1000-ohm, 1/2-w. composition resistor $\pm 5\%$ (Lafayette Radio 52R8073)
 R9—10K, 10-w. wirewound resistor (Lafayette Radio 33R46525)
 M1—0-1 d.c. milliammeter (Lafayette 99R50403)
 SW1—S.p.s.t. switch attached to R7 (Lafayette Radio 33R11891)
 SW2—D.p.d.t. miniature toggle switch (use as single-pole switch; Lafayette Radio 99R61624)
 K1—Remote-control relay, 5K coil, s.p.d.t. contacts, 1.4-ma. pull-in, 1.2-ma drop-out (Lafayette Radio 99R60915)
 Sonalert—P. R. Mallory Co. type SC-628 Sonalert electronic sounder (Lafayette Radio 12R74018)
 Case—6 1/4 x 3 3/4 x 2" plastic box with perfboard front panel (Allied Radio Shack 270-097)
 Misc.—9-v. transistor-radio battery, battery clips, perfboard, line cord, hookup wire, solder

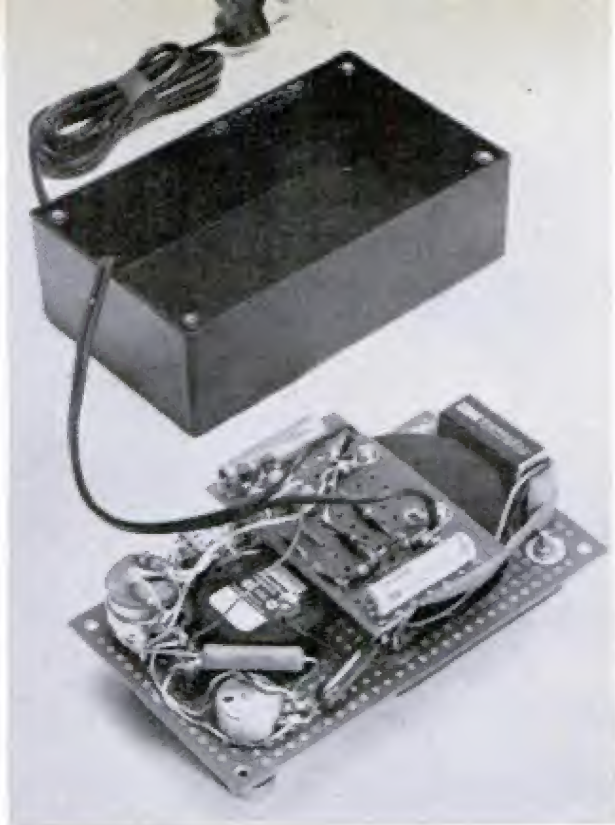
burn out. This is an especially serious problem with high-drain appliances like airconditioners, but it can also affect power tools and other motor-driven home equipment. Some motors have built-in overload protection, but many do not and their loss can mean a costly repair and replacement job.

While power companies don't intentionally allow line voltages to fall below the safe limit, accidental brownouts can

occur. The simple little current checker shown here keeps an eye on your line voltage and automatically beeps a loud warning if it falls below a preset level. It also sounds an alarm if the current goes off altogether, as in a power failure. While a blackout is obvious if it occurs at night when you're awake, it may not be if you're asleep or if it happens during the day when lights are normally off. The checker alerts you that there's been a power failure and keeps you from being fooled by clocks that don't tell the right time and morning alarms that don't go off when they should.

The voltage minder is built around a standard 0-1 milliammeter that measures current, a Mallory Sonalert that sounds a high-pitched beep when energized, and a sensing circuit that monitors line voltage and triggers the alarm at a preset point. The parts fit neatly into a 6 1/4 x 3 3/4 x 2-inch black Bakelite case. While any suitable box will do, this type was selected because it has a removable perfboard front panel that's easily cut and drilled for installing the meter and Sonalert. The VOLT ADJUST potentiometer (R2), the TRIP potentiometer (R7) and the SET/MONITOR switch (SW2) also mount in this panel.

The small parts—SCR, three diodes, two capacitors and five resistors—mount on a small separate piece of perfboard 2 7/8 x 2 1/8



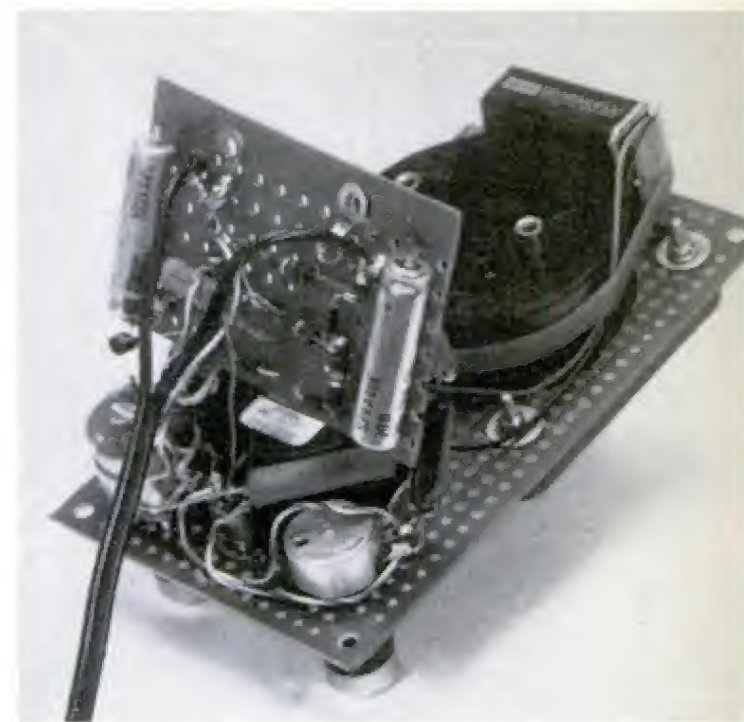
PARTS ARE MOUNTED in small black plastic case. While other enclosures can be used, this type is handy because it has removable front panel of perf-board that can easily be cut and drilled for in-

ches. This is held in place by the two terminal screws on the back of the meter. A conversion scale is needed for the meter so it reads in volts instead of milliamperes. The one shown here is designed to fit standard $3\frac{1}{8}$ -inch-square panel meters of the type sold by Lafayette Radio. Cut it out and paste it over the existing meter scale, being very careful not to touch the delicate meter needle. Wire the unit as shown in the accompanying diagram. Power resistors (R1 and R9) should be mounted in free space as they get hot and need good ventilation.

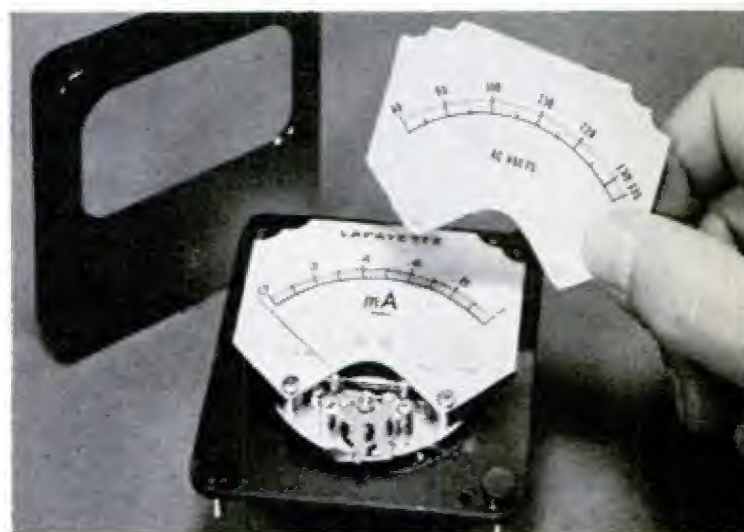
To use the checker, simply plug its line cord into any convenient wall outlet. With the SET/MONITOR switch in the MONITOR position (see diagram at SW2), the meter reads a.c. line voltage as it appears at the outlet. To set the checker to the desired trip point, flip the switch to the SET position. This cuts in the VOLT ADJUST potentiometer (R2). Adjust this control until the meter needle reads the voltage level at which you want the alarm to sound. Since 115 to 120 is normal in most areas, a setting of around 100 volts provides a safe trip point.

With the SET/MONITOR switch still at SET, adjust the TRIP potentiometer (R7) to the point where the Sonalert just goes on, then flip the switch back to MONITOR and

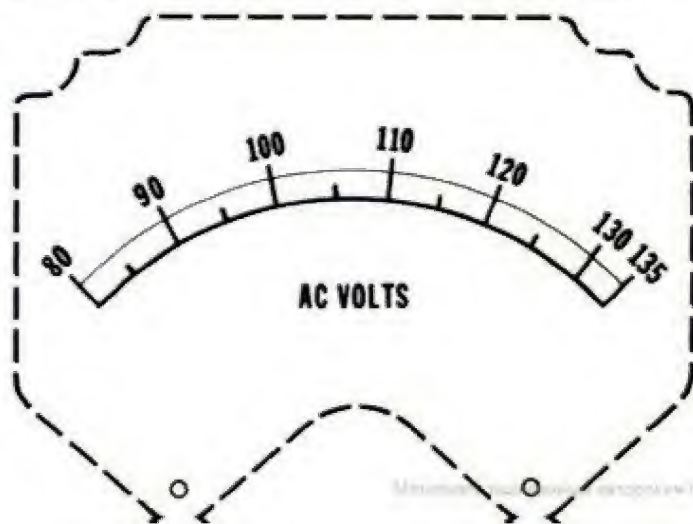
(Please turn to page 174)



stalling the meter, Sonalert and controls. Small components fit on separate scrap of perfboard held in place by two terminal screws on the meter. Board is shown tilted up at right before mounting on meter



CONVERSION SCALE must be added so meter reads in volts instead of milliamperes. One shown below, calibrated from 80 to 135 volts, is actual size and is designed to fit standard $3\frac{1}{8}$ -inch-square panel meters. Carefully cut it out along the dotted line and cement it over meter's existing milliamperes scale



**Sure way
to save:**

Fix your own alternator

By MORT SCHULTZ



The first step is troubleshooting: It's as easy as using an ohmmeter to check your diodes

DON'T TEST YOUR ALTERNATOR until you've checked out your battery and regulator, and even then, always check the alternator drive belt first. If the belt is too loose, worn, or glazed and slipping, alternator output will be reduced.

A damaged belt should be replaced with a new one of proper size, and adjusted properly. In adjusting tension, a drive-belt tension gauge is much preferable to the "press-in-by-finger" method: You'll minimize the danger of overtightening the belt. A belt that is overtightened will put too much strain on the alternator's bearings, which can cause them to fail.

A new drive belt is set tighter than a used belt, but a new belt is considered "used" after it has been in use for 15 minutes. In most cars, the drive belt is tightened by bringing leverage against the center of the alternator housing, with a pry

bar, running up the bracket nuts as you do.

All alternators consist essentially of two end-frame assemblies, a rotor and a stator. One of the end frames contains the diodes, which convert the alternating current generated by the stator and rotor to direct current.

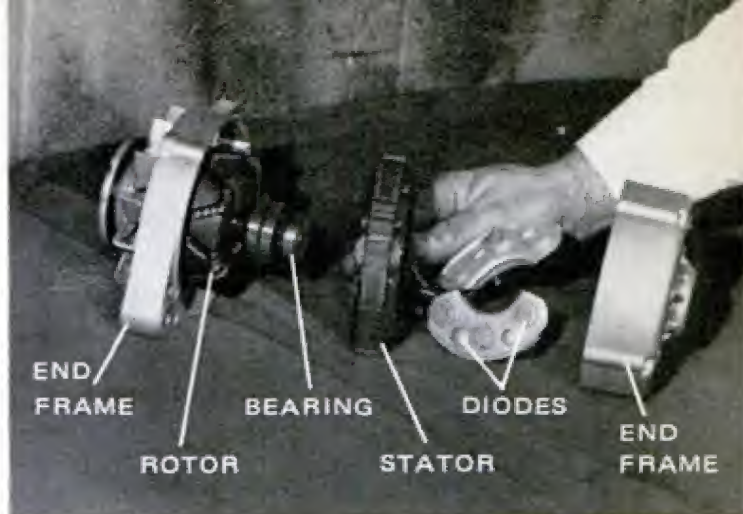
The rotor is basically a field coil wound onto an iron spool that is mounted between two iron poles. It revolves inside the stator, which is mounted between the end frames.

The stator is made up of loops of wire wound into slots of a laminated frame. There are two spring-loaded brushes on two slip rings on one end of the rotor shaft. The slip rings are attached to leads from the field coil, and the brushes are connected through a switch to the battery.

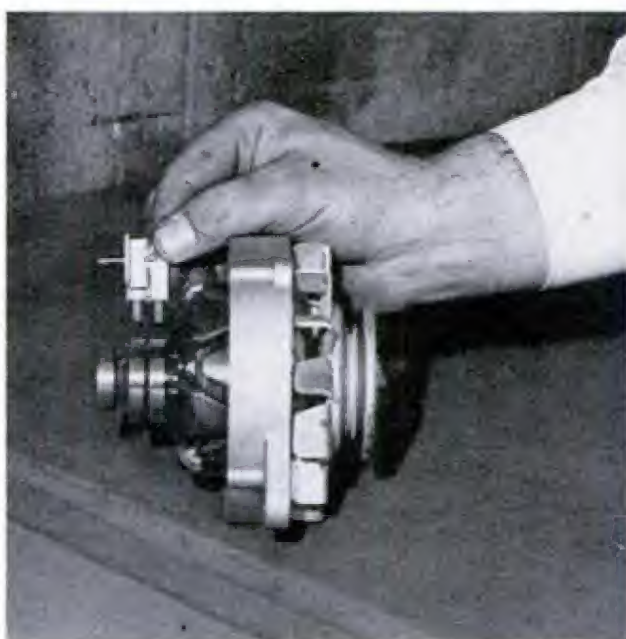
When the switch is closed, current



MARK ALTERNATOR before disassembling for bench testing to make it easier to reassemble properly



ALTERNATOR COMPONENTS can be checked out individually. Diodes are mounted on heat-sink assembly



CARBON BRUSHES ride on slip rings at one end of the rotor shaft. Periodically check them for wear



DISCONNECT DIODES before checking them and before bench-testing other components of the alternator

passes through one brush, through the slip ring on which the brush rides and then through the field coil. After leaving the field coil, the current continues through the other slip ring and brush—then returns to the battery through the ground path.

As the rotor revolves within the stator, the moving magnetic field that's created cuts across the stator windings, inducing an alternating current which is converted to direct current by the diodes. The diodes are electronic check valves: They permit current to flow in one direction only—to the battery.

Alternators normally have six diodes—three negative and three positive. With some alternators, the diodes are contained in a heat sink. To replace a bad diode, you have to replace the whole heat sink and all the other diodes it contains. With other

alternators, diodes are individually pressed into the end frame.

By knowing exactly what component(s) you need—rotor, stator or diodes—you can save money. For example, in the New York City area a new alternator costs about \$65—a rebuilt unit, about \$35. A new rotor costs \$25, a new stator costs \$15 and new diodes (press-in types) cost \$2 each.

To test an alternator and regulator, you need a service manual for the car or service instructions for the alternator and regulator. There are six makes of alternators in Detroit cars: Motorcraft (Autolite), Chrysler, Delco, Leece-Neville, Motorola and Prestolite. Each is somewhat different from the others and connections for tests vary.

For example, earlier Delco and Autolite units employed electro-mechanical volt-

age regulators to limit output voltage. Later models have solid-state (transistorized) regulators.

Service instructions may be obtained by writing the technical publications department of the company that makes your alternator and regulator. Be sure to supply the model and serial numbers of the unit, which are normally embossed on a nomenclature plate attached to the alternator end frame: Ford Parts Div., Ford Motor Co., Livonia, Mich. 48150; Mopar Div., Chrysler Corp., 341 Massachusetts Ave., Detroit, Mich. 48231; Delco Products Div., General Motors, 2000 Forrer Blvd., Dayton, Ohio 45401; Leece-Neville Co., 1374 East 51st St., Cleveland, Ohio 44103; Motorola Automotive Products, Inc., 9401 West Grand Ave., Franklin Park, Ill. 60131; Prestolite Co., 511 Hamilton St., Toledo, Ohio 43602.

To test an alternator and regulator, you also need a voltmeter/ammeter with carbon-pile rheostat to control voltage, and

High resistance in circuits may block flow of current from alternator that's okay

a tachometer. If the alternator has to come off the car for bench testing, you will need an ohmmeter.

For the alternator output test, instruments are connected as described in the service instructions. The engine is started and allowed to run at a speed specified by the manufacturer—1250 rpm, for example.

The carbon-pile rheostat is adjusted so that the voltage specified by the manufacturer is obtained (15 volts, for instance). Now read the ammeter. Current output, which depends on the rated capacity of the alternator, should be to manufacturer's specifications.

Alternators generate from 30 to 60 amps. The size of the unit in your car depends on the car's electrical needs. Vehicles requiring more electricity because of more accessories, such as airconditioners, power windows and power seats, have alternators of greater capacity.

Keep in mind that during the alternator output test the regulator is out of the circuit. Complete the test as quickly as possible and do not exceed the engine rpm requirement of the manufacturer.

If the ammeter shows that the alternator is operating at its rated capacity, any problem in the charging system that may exist is *not* being caused by the alternator. It may be the fault of the regulator. However, if tests indicate that the alternator isn't putting out as it should, the trouble may lie with resistance in the circuits which is blocking the flow of current. In other words, the alternator may be okay—its product just isn't reaching the market.

So before you remove the alternator for testing on the bench, conduct resistance tests of the field and charging circuits. You may save yourself a lot of work. High resistance is usually caused by loose or corroded connections.

If the alternator has to come off the car for bench testing, the tests you have to make are as follows (before disassembling the unit, mark or scribe a line across the end frames to assure correct reassembly):

- **Diode test**—Diodes fail more often than the stator or rotor. An ohmmeter will tell you if a diode has shorted out or opened up.

- **Stator test**—Test the stator for grounds and continuity. Tests require that leads be unsoldered at the diodes.

- **Rotor test**—Test the rotor for opens and grounds.

Another alternator problem is noise. An alternator requires no lubrication, because bearings are permanently lubricated. If a unit appears to be making noise, be sure the noise is coming from the alternator. Water-pump noise in particular is often mistaken as noise from the alternator.

A squealing sound may just be a dry drive belt. Adjust the belt and apply belt dressing. If this doesn't eliminate or lessen the noise, then the problem may be a bad bearing inside the alternator.

Disassemble the unit and check the rotor shaft for scoring, wear and out-of-round. If the rotor looks bad, replace it. Bearings are usually located on the rotor shaft or end frames. They can frequently be pressed out and replaced.

Another cause of alternator noise is a diode which is going bad. This condition will create a whine.

Testing an electromechanical regulator is similar to checking alternator output. The only difference is that the regulator is allowed to remain in the circuit. If the test doesn't show that the regulator is

controlling alternator voltage at about 14 volts, the regulator may need an air-gap adjustment. This is usually done by means of an adjustment screw and/or bending one of the contacts.

Transistorized regulators are often inside the alternator, which means that the alternator must be disassembled to reach them if one has to be replaced. A voltage-range test informs you if this regulator is performing as it should. If testing reveals that the alternator is being controlled between 13.5 and 14.5 volts, you have no regulator problem.

For the most part, transistorized regulators cannot be adjusted or repaired but must be replaced as a unit.

There are several precautions to keep in mind when dealing with an alternator. They will prevent damage and protect you from injury.

● *Never hook up test meters without first disconnecting the battery ground cable. Make connections, double check to make sure polarity is correct, and then*

reconnect the ground cable. Remember—plus to plus, negative to negative. Incorrect polarity, even momentarily, will ruin diodes.

● *Never ground the field circuit between the alternator and regulator. This will damage the regulator and may burn out the field wiring. Only some alternators are fused.*

● *Watch out for the output terminal of the alternator. It is always "hot." If you accidentally ground or flash this terminal, you will cause a short.*

● *Make sure that the ignition is turned off, before you go near either the alternator or regulator.*

● *Use tools which are insulated with plastic sleeves or tape to prevent accidental shorts.*

● *Take care when you add oil or coolant to the engine. Keep it away from the alternator. If oil or coolant gets into the air intakes, slipping will occur between brushes and slip rings that will cause a decrease in alternator output.* ★ ★ ★



ALTERNATOR OUTPUT TEST (upper left) is performed using a volt/ammeter with carbon-pile rheostat. Disconnect battery ground, make connections, check polarity and reconnect. The rotor (left) is checked with an ohmmeter for grounds or an open circuit. The transistorized regulator (above) is encapsulated

BETTER WAYS TO DO IT!



LOW-COST "BULLHORN" can be made from a half-gallon bleach bottle. Wash bottle thoroughly, then cut out the bottom and you have a ready-to-use megaphone with handle.—E. V. Reyner, Salinas, Calif.

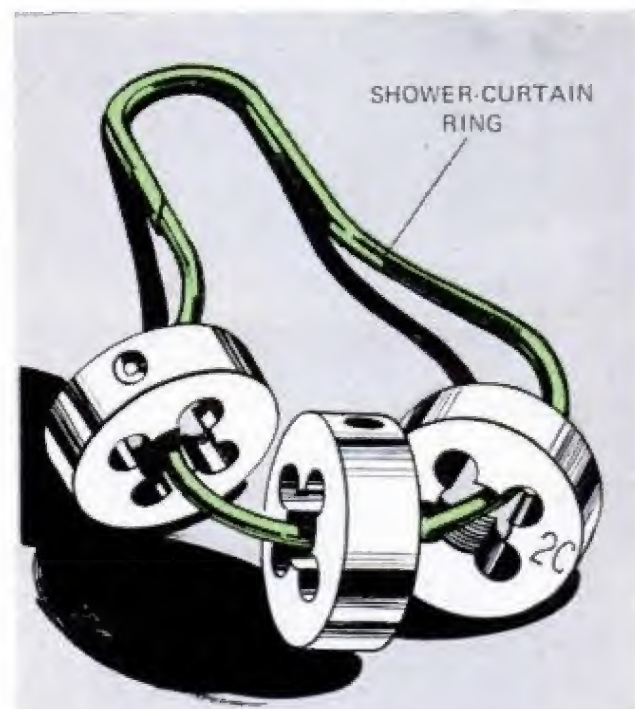


PAINT TOUCH-UP APPLICATOR is made from a $\frac{1}{2} \times 1 \times 1\frac{3}{4}$ -in. piece of foam rubber and two tongue depressors. Clamp half the rubber between tips and wrap ends with tape.—G. Bertrand, Le Saules, Que.

Illustrations by Adolph Brotman



CELLOPHANE TAPE END will be easy to spot if you slip a penny in place before putting away the roll. This stunt saves annoyance of picking at the end with your fingernails or a knife.—Joe Braunstein, New York.

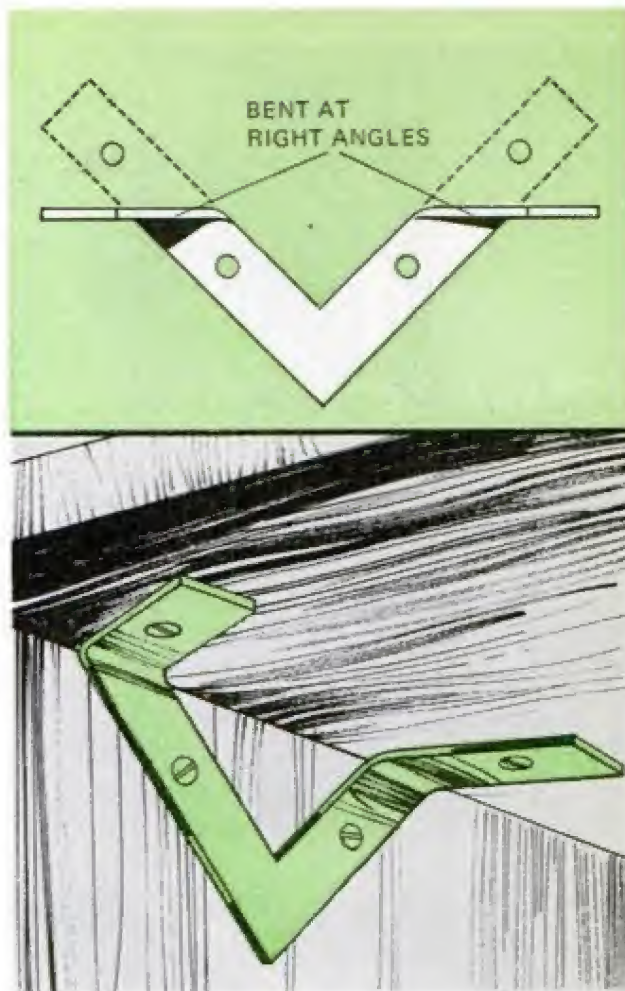


DIES ARE EASILY FOUND if kept on a shower-curtain ring as shown. Use separate ring for duplicate sizes, hang them from nails into studs or hooks on perforated hardboard.—W. H. McClay, Pasadena, Calif.

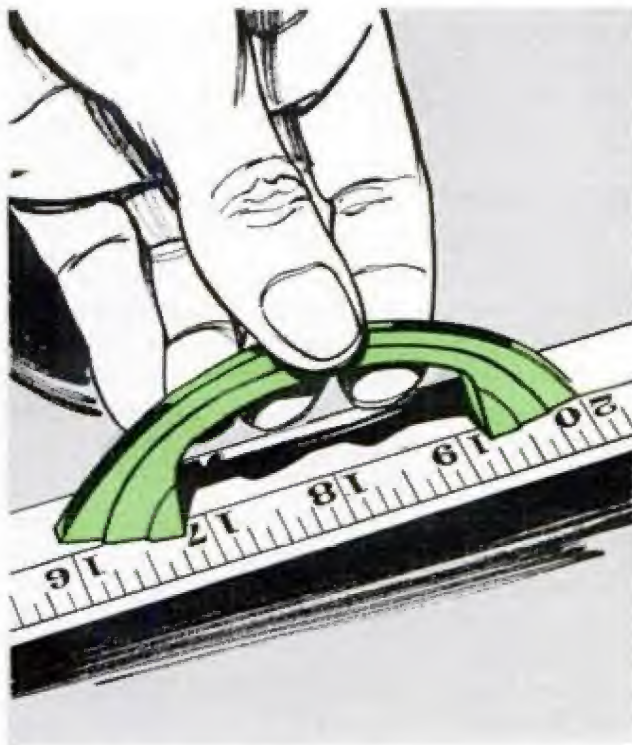
POPULAR MECHANICS



A FRUIT PICKER—for the high ones—can be made from an old potato masher attached to a long handle. Drive a 6d nail in the handle as shown to hold the pail securely in place.—W. H. McClay, Pasadena, Calif.



NEAT, STURDY SHELF BRACKETS can be made by bending metal corner braces at right angles as shown. Braces have predrilled, countersunk holes, so they can be used immediately.—Ken Patterson, Regina, Sask.



ATTACH A DRAWER PULL to the center of a yardstick and you will find this measuring tool will be easier to manipulate. Adding the handle provides good one-hand control.—William Swallow, Brooklyn.

AUGUST 1972



BED RAILS will stay put if you replace the original pins that hold the connecting hooks. Drill through, add the metal plate and use machine screws and nuts to hold it.—James P. Marshall, Barrington, R.I.

HINTS FROM READERS



Easier-to-read depth gauge

The depth gauge on my drill press had graduation lines all of equal length except at the 1-in. markings, which made it hard to read intermediate depths quickly. Using a fine-tipped permanent felt marker, I extended the $\frac{1}{4}$ and $\frac{1}{2}$ -in. marks as well. The trick worked and makes quick readings easy and accurate.—*John F. Pilznien-ski, Dearborn Heights, Mich.*



Notebook binder acts as toolholder

The metal portion of a discarded three-ring notebook binder can serve as a good paintbrush holder. Fasten the three-ring device to the top of your stepladder. Tools with holes drilled in their handles can be removed and replaced while you work, and, when ladder is to be moved, snap shut the rings and tools will be securely held.—*Ken Patterson, Regina, Sask.*



This grip's a grabber

Silicone compound spread on the palms of cloth workgloves, in a series of dots or beads, lessens the tendency of the gloves to slip when the wearer grasps tool handles and the like. The rubber-like coating need not be thick enough to cause appreciable increase in glove stiffness. Let the silicone dry before you use the gloves.

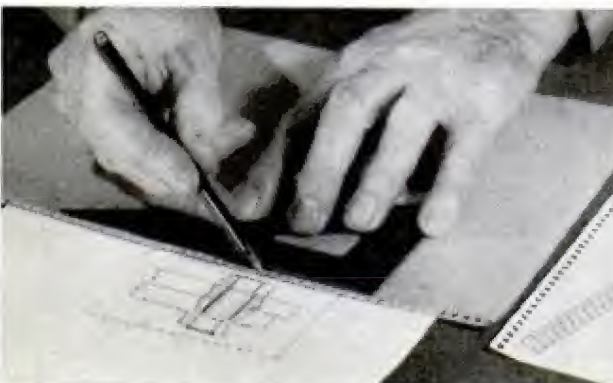
—*B. W. Ervin, Kent, Ohio.*



Eyeglass case makes 'holster'

A discarded eyeglass case of the type with an attached pocket spring-clip makes a handy carrying case for pruning clippers or other small gardening tools. Attached to your garden cart as shown, clippers are always at the job and cutting edges are protected when the tool is not in use. And tools won't be left outside.

—*Marshall Lincoln, Wickenburg, Ariz.*



Drawing dotted lines

A page or cover from a spirally bound booklet can be used for drawing neat dotted (or dashed) lines. Place a straightedge to guide a ball-point pen or pencil across centers of the series of holes through which the wire spiral had been inserted. To remove a spiral, clip one end and simply "unscrew" the coil.

—*Walter E. Burton, Akron, Ohio*

At last—a new paint can



PRY-OUT TINT PLUG lets dealer add color, replace plug and machine-shake without removing cover. Hole admits portable-drill stirring rod for home mixing, keeps the paint from flying. Plug seals the hole tightly

EVER HAD PAINT SPATTER all over when you put the cover back on the can? Or had a devil of a time prying it open with a screwdriver? Or found the paint dried up when you were ready to use it again? If so, you'll be happy to know that house paint is beginning to be packaged in a container with a radically different cover that's designed to make painting less of a mess and chore.

In the first significant change in paint-can design in over 50 years, Continental Can Co. is producing a one-gallon container that opens like a can of peanuts—the complete top tears off by pulling a tab. Called Easy-O, it replaces the old-type press-on metal cover with a snug-fitting press-over cover of polyvinyl. With the rim of the can no longer a sealing factor, any paint that remains in the rim in no way interferes with the replacement or tight seal of the storage cover—the plastic pull-off cover fits *over* the can.

An additional novel feature of the can is a plastic pry-out tint plug that lets the paint dealer add tinting pigments, reseal and agitate the can by machine. The removable plug also lets the do-it-yourselfer stir the contents with an electric drill without having the paint fly all over. The new can is also a bit taller than the familiar gallon container to provide extra "headroom" for the paint and reduce the likelihood of spillage when stirring and pouring.

★★★



FINGER RING on tear-off, throwaway cover makes it easy as pie to open can, eliminates prying off cover



PRESS-ON PLASTIC CAP comes with each can to seal it tightly after can's top is torn off and discarded

Things to keep

Colonial weather station

This weather station not only makes an attractive wall decoration for den or family room; it keeps you posted on relative humidity, temperature and barometric pressure 24 hours a day. The eagle and instrument plaques are cut from knot-free (clear) white pine. To simplify cutting and working the small plaques, gang the three in a row and cut them apart after making the holes and boring the corners.

Holding small pieces for shaping is difficult, especially when the work is smaller than the router base. To do this simply and safely, make a workholder by driving a few brads up through the bottom of a piece of 1/4-in. plywood and clamp or nail this to the workbench. The work is simply pressed down on the protruding brads.

Humidity and temperature gauges are merely press-fitted into their holes. A separate flange is provided to hold the barometer bezel. This is pressed over the flange after it is screwed in place.

Since weather instruments must "breathe," wood spacers glued to the backs keep the wood plaques out from the wall. Tiny screweyes and brass chain link the plaques, the screweyes being opened to accept the chain and then pinched shut.

You can finish the wood parts as desired; the new antique colors are ideal for pine. The three weather units, plus the eagle, sell for \$21 postpaid from Armor Co., Box 290, Deer Park N.Y. 11729. New York residents add sales tax.

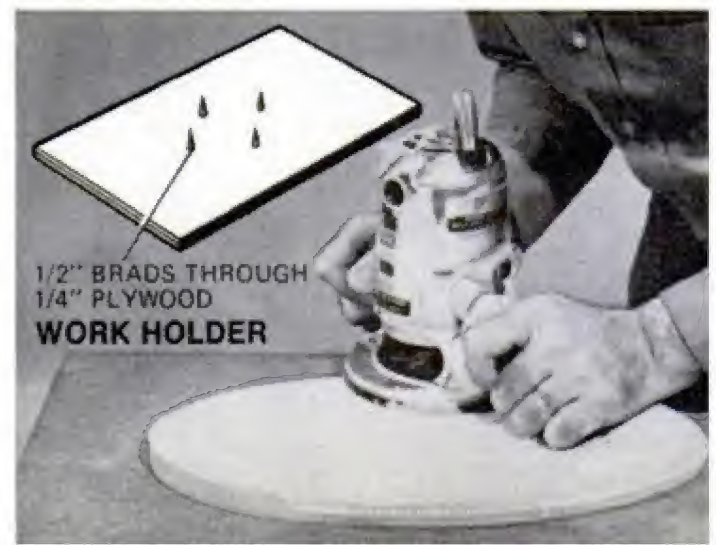
—John Capotosto, New York City

INSTRUMENTS ARE HELD in panels by a snug press-fit. The holes can be sawed, or bored on a drill press

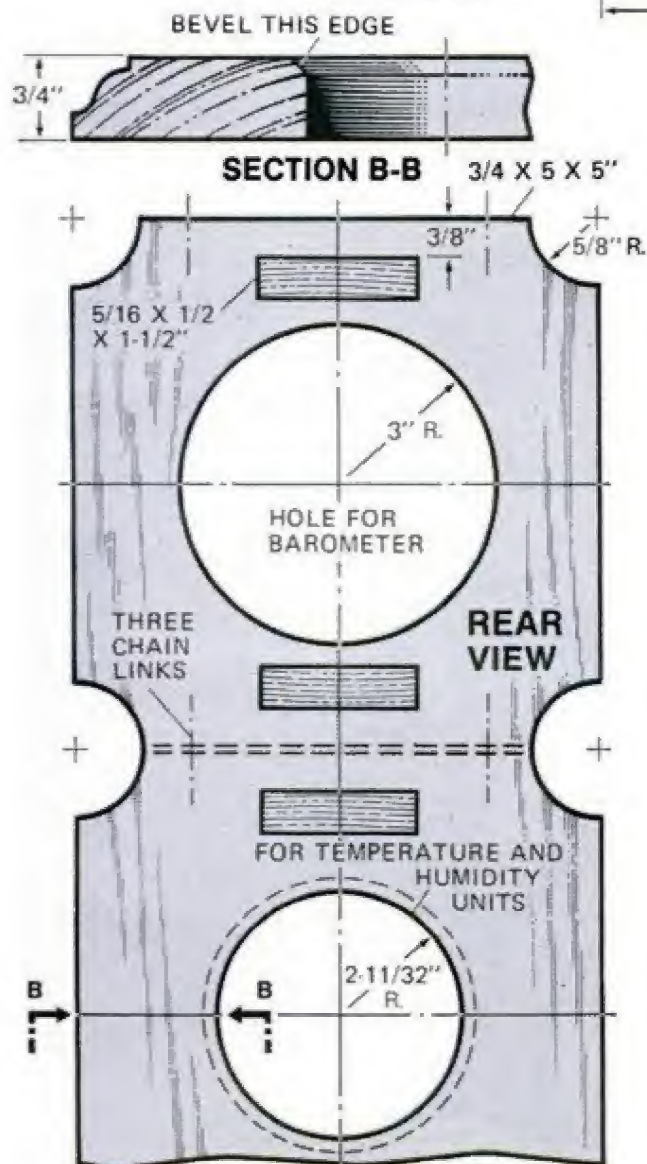
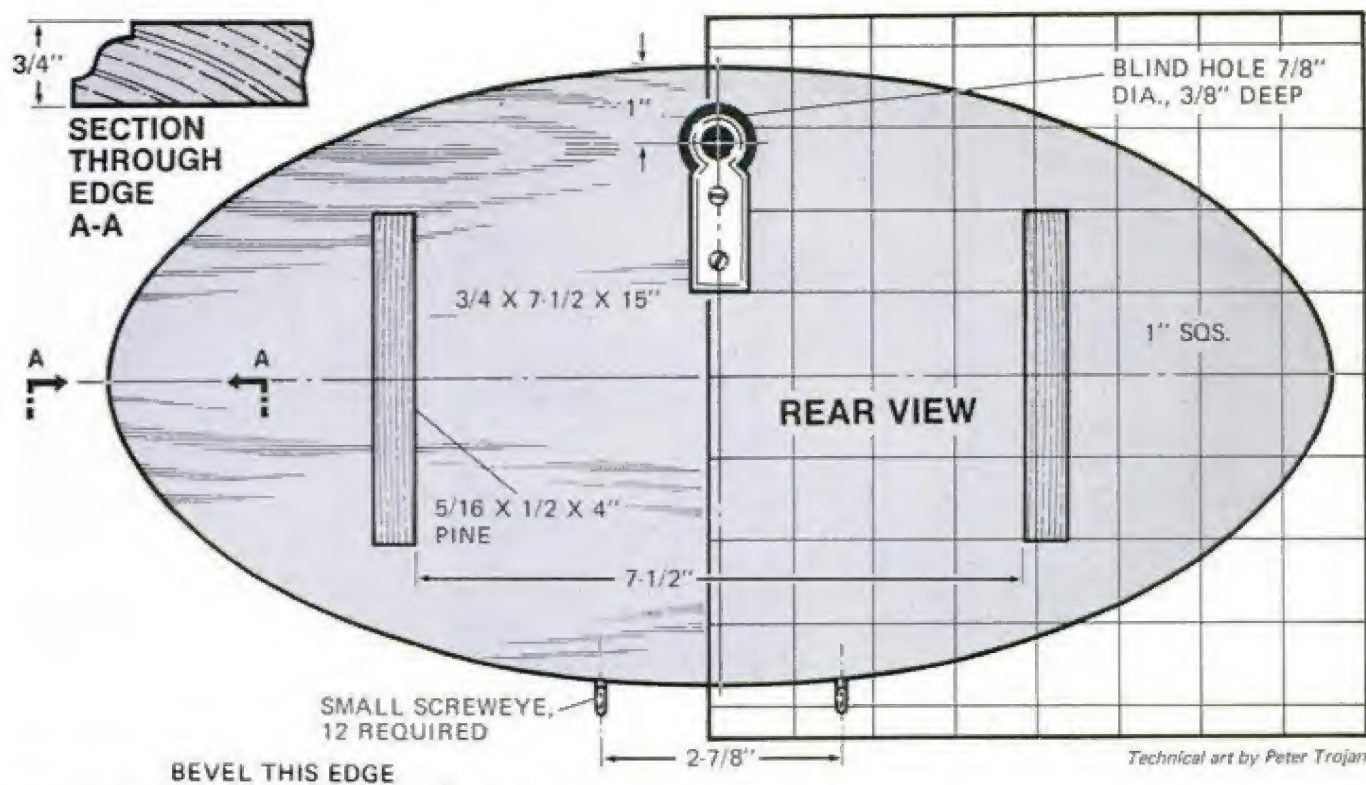
SAWING HOLES for instruments is less of problem when three panels are sawed as one, then cut apart



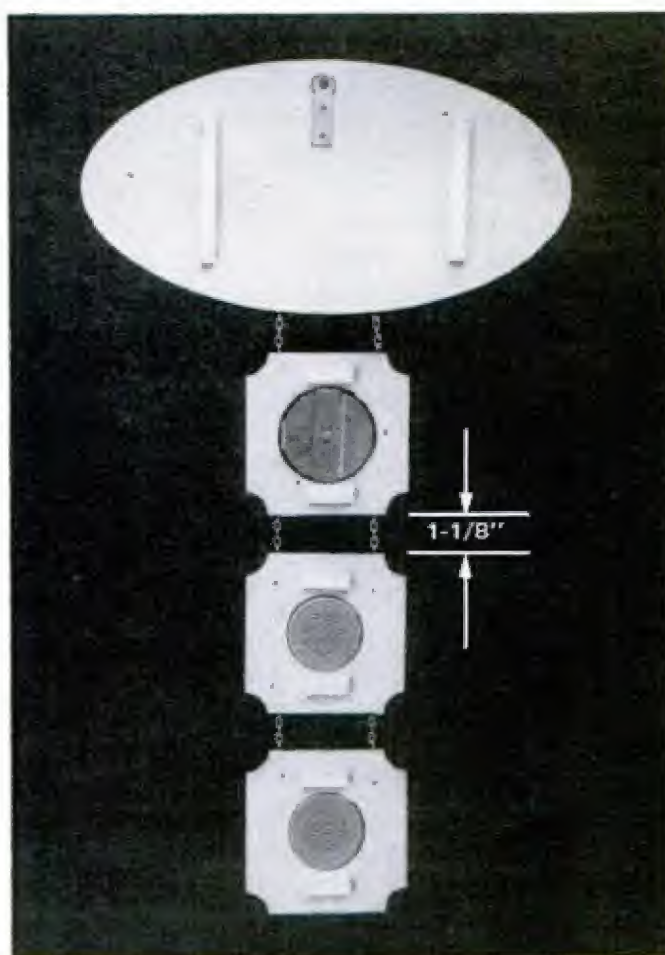
HOLDING WORK when shaping edge is made easy by resting it on brad points driven up through plywood



Our workshop humming



SPACER BLOCKS ARE GLUED to back of panels to hold instruments out from wall so they can "breathe"



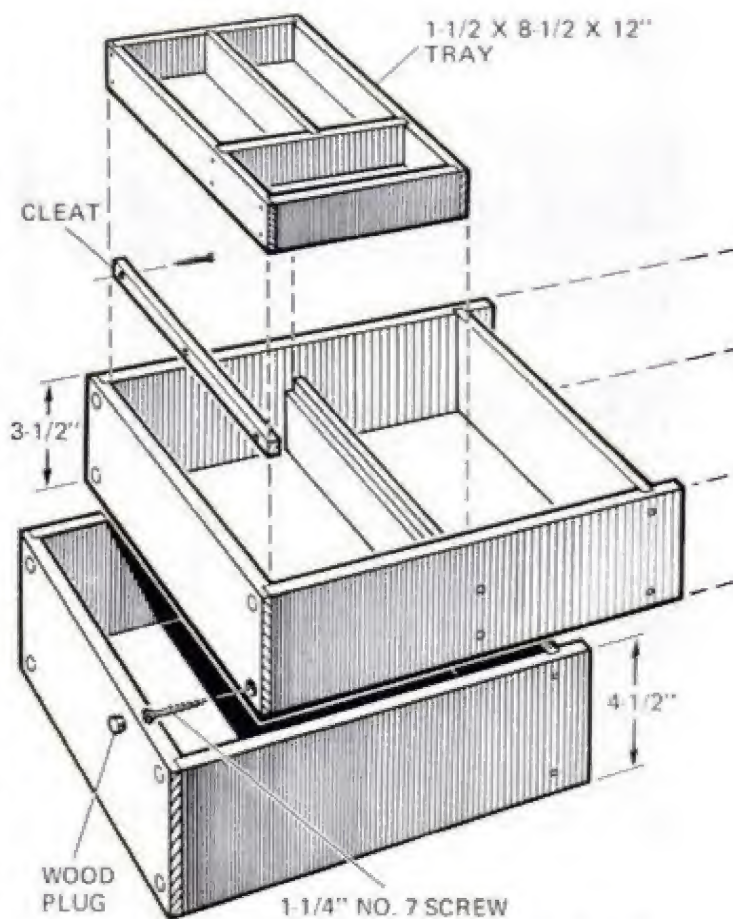


Hobby worktable

Here's the handiest worktable the hobbyist, would-be artist or finger painter could ask for. Consisting of a rolling taboret which parks under a slant-top drawing table, the two-piece affair provides a safe storage compartment (under a lift-off top) for wet, unfinished paintings, and storage galore for all kinds of artist supplies in two roomy drawers and a hinged-door compartment. The drawing table remains affixed to the wall by four angle brackets, while two caster-fitted blocks attached to the taboret let you wheel it in and out, yet it stays put when in use.

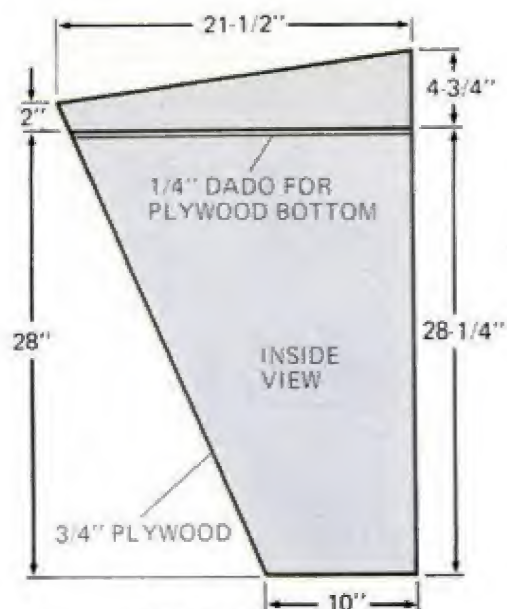
Both sections are made nearly all of plywood. The bottom of the traylike compartment of the drawing table is $\frac{1}{4}$ -in. plywood set in $\frac{1}{4}$ -in.-deep grooves cut in facing surfaces of the slanting legs.

The top of the taboret was cut from a Formica-covered countertop cutout. It's dadoed on the underside to fit over the back and side panels. Side panels are rabbeted along the bottom to house the bottom panel; along rear edges to house the back.—Hal Kelly, Fort Pierce, Fla.



Technical art by Peter Trojan

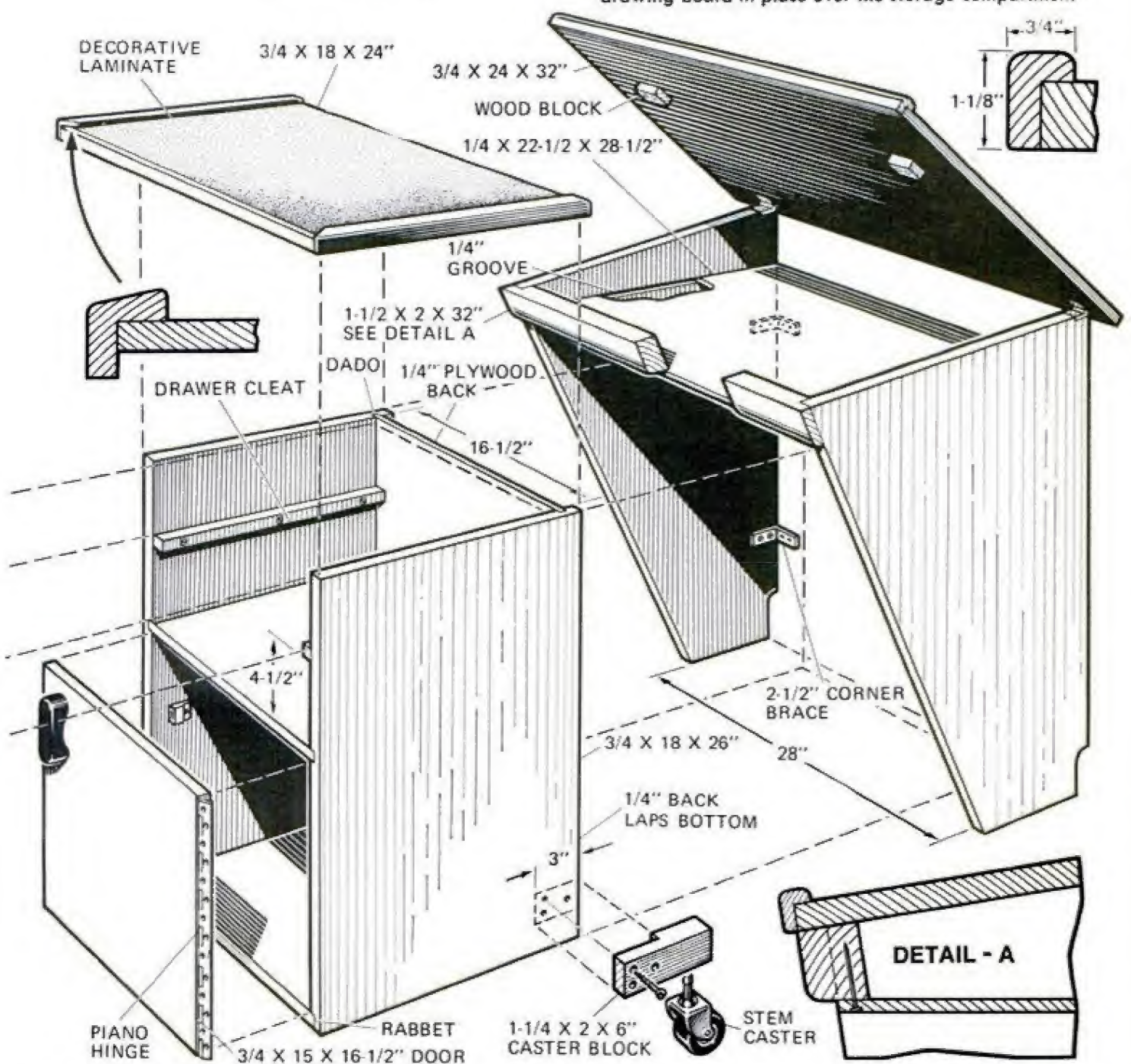
POPULAR MECHANICS

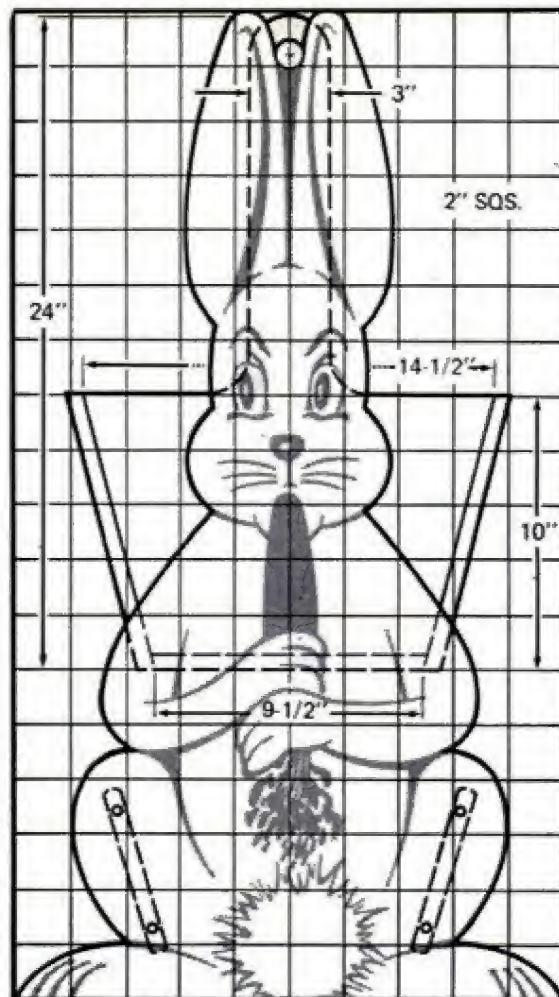


END PATTERN



WOOD BLOCKS glued to the underside keep lift-off drawing board in place over the storage compartment



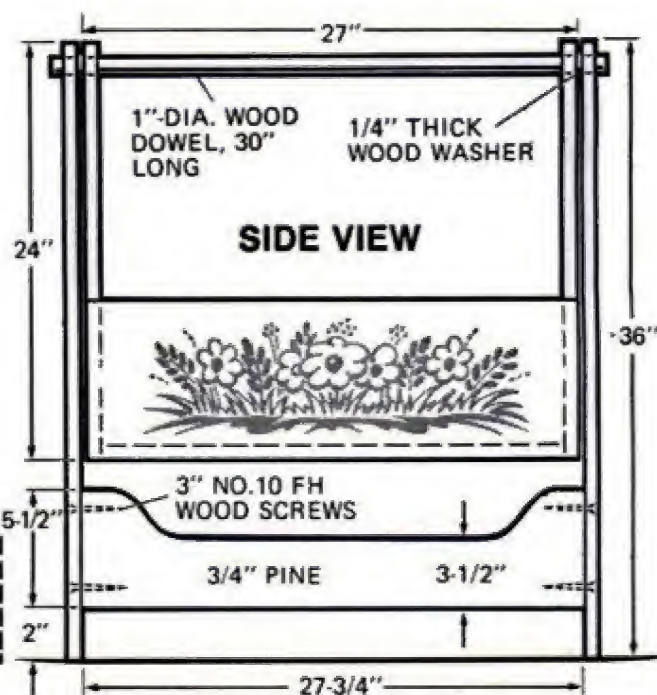
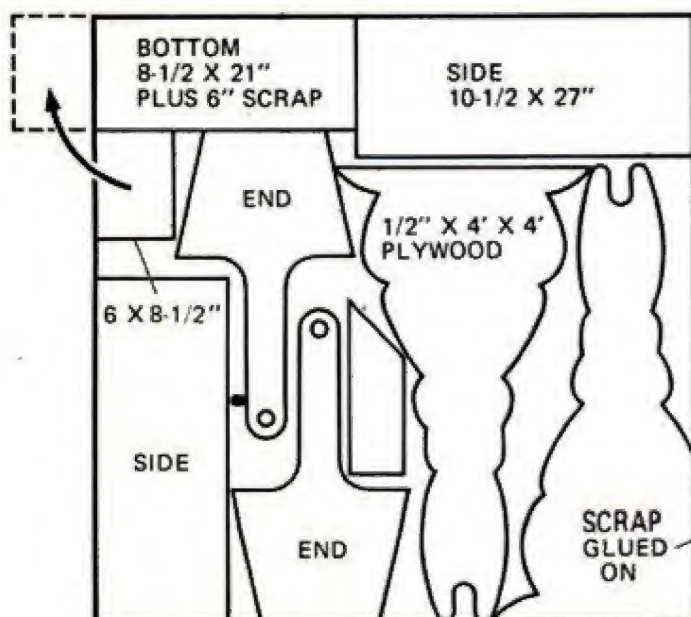


Bunny cradle

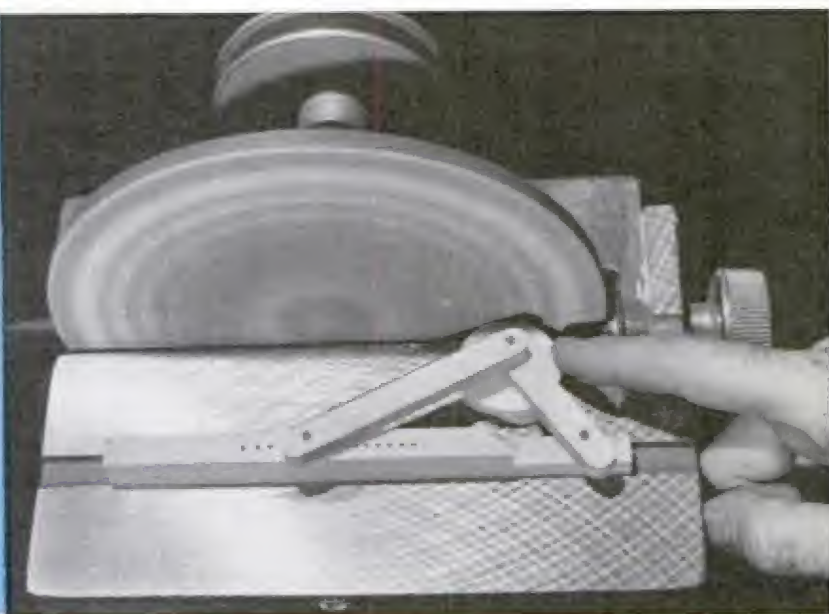
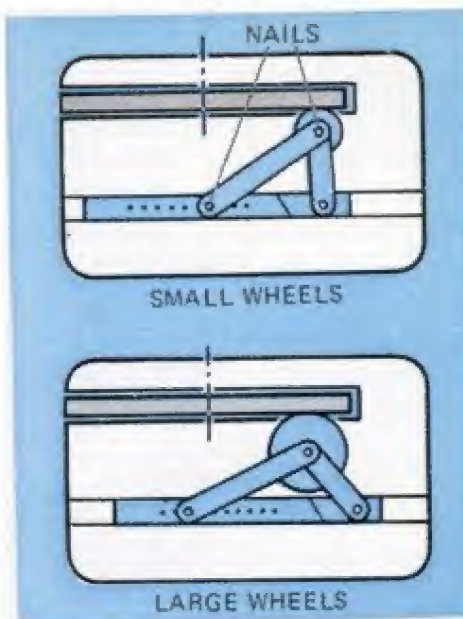
This novel cradle swings instead of rocks, and you can lift it out of its rabbit stand and carry it like a bassinet. Most of the parts are cut from $\frac{1}{2}$ -in. plywood, and the diagram below shows how you can lay them out on a 4x4-ft. panel with a minimum of waste. The two rabbit cutouts

are joined together at the bottom with a pair of $\frac{3}{4}$ -in. pine stretchers cut from a 1x6 board. Notches in the rabbit's ears hold the projecting ends of the 1-in. dowel handle which passes through the upper ends of the cradle.

—Hank Clark, Dumont, N.J.



Sanding jig turns out perfect wooden wheels



Not wanting to buy any parts when I was making some wooden cars and trucks for my kids, I dreamed up this adjustable sanding jig which enabled me to "turn" perfectly round wheels on my disc sander every time.

Here's how it works: First, I adjust the jig for the size wheel I want. Then, starting with a square wood blank, I make a hole in the center for the nail pivot. Now

with the sander running I place the jig in the table groove, and with one hand holding the jig and the other the blank, I slowly move the jig forward to meet the disc as I turn the blank with my fingers. One time around and I have a perfect wheel. Downward direction of rotation of your sanding disc determines which end of the table to use.

—Paul D. Fiebich, Utica, Mich.

Silicone sealant pads clamp jaws

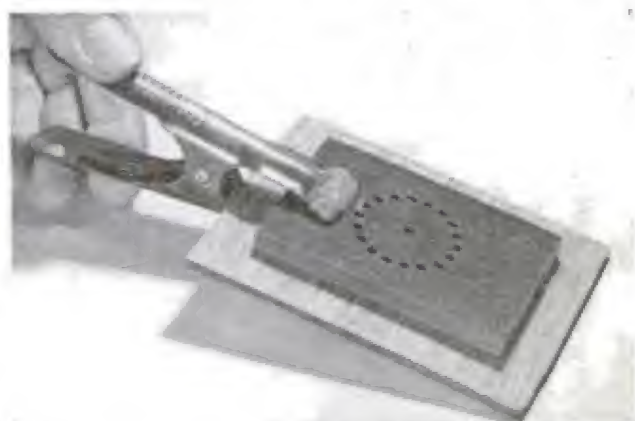
A simple way to pad or cushion the bare jaws of a steel spring-clamp of the type shown is to coat the ends with silicone sealing compound. To do it, prop the jaws open with a wood block and spread the compound over the tips to a thickness of about $\frac{1}{8}$ in. and let it "harden" for 24 hours.

This eliminates the need to protect finished wood surfaces from marring by the jaws.—Hugh Midity, Anchorage, Alaska

Quick washers from tubing

Emergency washers can be made by cutting soft steel, copper or aluminum tubing into short lengths, $\frac{1}{4}$ in. or more depending on diameter, and compressing the rings endwise in a vise or by hammering. Since the amount of compression affects thickness and diameter of the washer the best length and degree of compression for a particular job are found by trial or experience.

—Walter E. Burton, Akron, Ohio.





Hints from

Prevent clogged fuel lines

You can lessen the chance of mower-engine failure by following a procedure used by cautious pilots and experienced mechanics. To keep tiny flecks of rust and other bits of matter from entering small passages in the carburetor, strain gasoline through a piece of chamois. A small patch in the funnel does the trick.
—Marshall Lincoln, Wickenburg, Ariz.



Toothpaste cap holds bumper

Bumpers for doors and other moving items sometimes are made from short sections of rubber garden hose, but mounting them can be a problem. One solution is to use a plastic toothpaste-tube cap that fits tightly inside the hose. The cap is drilled in the center for a mounting screw and forced into the hose section.

—Walter E. Burton, Akron, Ohio.



Styrofoam gluing jig

A block of rigid plastic foam will prevent ball-shaped objects from rolling about while being glued together in series or patterns. To glue the marbles shown, a guideline was drawn on the foam surface, and then, after epoxy glue was added to each marble, it was pressed into the foam and glued to the preceding marble.

—Burt Webb, Skokie, Ill.



Sanding stunt to save corners

When using a fast-cutting power sander to smooth a small, flat surface such as the lid of a trinket box, you can avoid accidental overcutting at the edges by surrounding the work with wood. The protective wood border can be made by clamping strips flush with the top surface. If necessary, lower strips for finish sanding.
—B. W. Ervin, Kent, Ohio.



Chain can be used as drawer pull

A short piece of chain secured at the ends by bolts or Pop Rivets makes a novel drawer pull. By placing spacers under it, the taut chain can be positioned for easy finger gripping. "Drawer" shown has chain riveted to end of a solvent can whose side has been removed to convert it into a small-parts drawer for the workshop.

—Walter E. Burton, Akron, Ohio.

readers

When you need a stronger dowel

A good way to beef up shear strength of a wooden dowel is to bore it lengthwise to receive—in a snug fit—a metal core made from a large nail or hardened steel rod. Normally, the rod is flush with the dowel ends; in the photo it was pushed part way out to be seen.

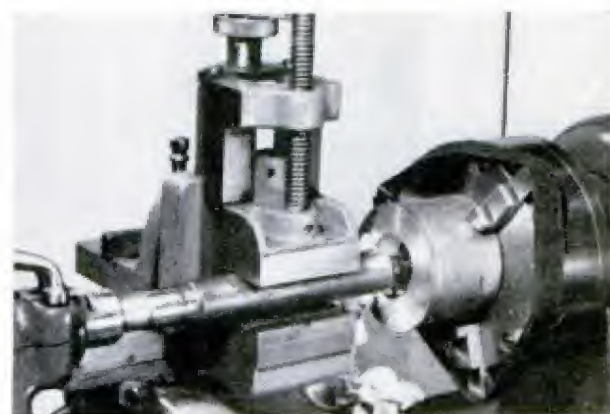
—W. B. May, Oak Park, Ill.



Attachment holds big boring bar

A boring bar designed for a 14-in. lathe turret can be used on a 9-in. bench lathe by clamping it in a carriage-mounted milling attachment. To ease the stress on the attachment, and to prevent the possibility of its shifting under pressure, apply boring force to the end of the bar by feeding the tailstock spindle against it.

—Walter E. Burton, Akron, Ohio.



Tape reduces a chuck hazard

If a workpiece cannot be clamped in your lathe chuck without having the jaw ends projecting beyond the chuck body, the projections could be considered a hazard. One way to treat such a chuck is to wrap two layers of smooth masking tape around the chuck body and over the angular jaw ends.

—E. B. Walters, Chicago.



NEXT MONTH IN SHOP AND CRAFTS

25 PAGES OF GOOD IDEAS FOR BETTER HOME ENTERTAINING. Now that fall is just around the corner, it's time to start thinking about what you can do to improve the at-home entertaining scene. PM's round-up of ideas—from a piano bar to clever "cover-up" suggestions that let you convert an unfinished basement to a party room shortly before the party—show what you can do to make your home the "life of the party." Included are hi-fi cabinets, an out-of-sight home movie screen and the latest products for the good life at home.

ALL-TIME GREAT NO. 6: A WORKBENCH SETUP FIT FOR A PRO. Just about all homeowners, do-it-yourselfers and tradesmen have one common need: A good, sturdy workbench with a wall cabinet for tools. We first published this deluxe bench in 1951 and since updated it by adding plastic laminates, perforated board and a shop-built light fixture. Plans are included to let you duplicate the setup.

SHORT COURSE IN POWER TOOLS; BENCH-SAW KNOW-HOW, PART 3. Parts 1 and 2 covered jigs, accessories, work habits and dado sawing. In part 3, you'll learn how you can add the professional touch to all your projects by using a molding head.

Build this cabinet for your router and you'll have an Instant 'shaper' for your shop



By WALTER E. BURTON
Photos by the author

THIS PORTABLE ROUTER was converted into a shaper by inverting it in plywood cabinet

IF YOU TURN a portable router upside down, you have, essentially, a wood-working shaper. To do it, the inverted router must be supported in such a way that it can function as a shaper with work guides, guards and the like. This shop-built version was designed to accommodate a Millers Falls MF router, Model A, catalog No. 7200. But, where necessary, dimensions can be altered for your own router.

The router hangs suspended from the underside of the cabinet top so that it can be removed for conventional routing operations by unscrewing four nuts. The hinged top tilts upward for convenience in changing cutters and making adjustments—although you can make cutter-height settings by reaching into the cabinet.

The cabinet top is hinged to the rear panel. Centered on the top is a $\frac{1}{8}$ x 8 x 8-in. aluminum plate that rests in a recess

so plate surface and adjacent wood are in the same plane. The hole at plate center is approximately $1\frac{1}{8}$ in. in diameter. In the wood top, concentric with this hole, is a 6-in.-dia. opening for the router base. Check your router's shoe diameter before cutting this circle.

You can form the $\frac{1}{16}$ -in.-deep recess by routing out most of the area with a straight bit. Leave an "island" in the center until last so the router shoe is supported. Then, remove the island with a router bit in a drill press. Next, jigsaw the 6-in. opening. Fasten the plate in its recess with two countersunk wood screws near opposite corners.

To determine the center of the $1\frac{1}{8}$ -in. hole, insert a pointed cutter in the router and place the router base into its opening. The point where the bit touches the metal plate is the center for the hole. Use two 2-in. butt hinges to join top to back panel.

Although the router's weight will hold the top down, rigidity is increased by installing a simple wooden latch at the corner near the front panel hinge.

The router-mounting arrangement is dictated by router-base construction. For the tool shown, two $\frac{1}{8} \times \frac{3}{4} \times 7$ -in. aluminum strips, with $\frac{1}{16} \times \frac{3}{4} \times 4\frac{5}{8}$ -in. pads (to compensate for difference in router base and wood thickness) riveted to them, worked fine. Four 10-24 bolts extend through these strips, through countersunk holes in the metal top insert and plywood and are secured to the cabinet top with nuts and washers.

The cabinet and cabinet-top sizes are not critical. The dimensions given provide adequate space, although the power cord must be curved sideways in order to clear the bottom at the usual cutter depth settings.

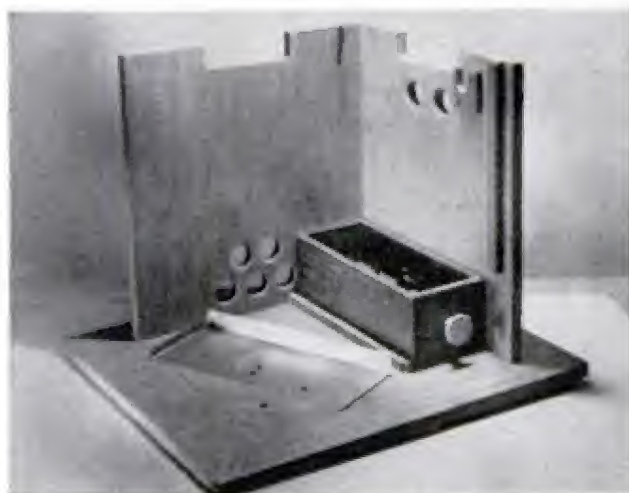
Since a router motor "breathes" by



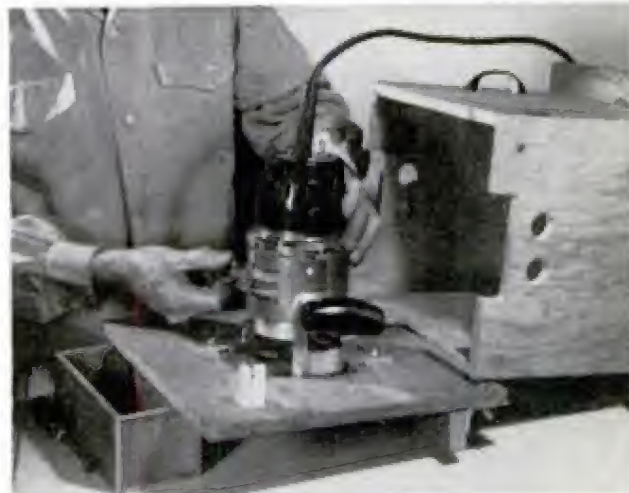
ROUTER CUTS RECESS in cabinet top to hold metal plate against which the router base will be clamped



BOTTOM OF TOP PANEL: Router is clamped against metal plate. Two strips make up thickness difference



IN PARTIALLY ASSEMBLED CABINET, the accessory drawer and some vent openings for airflow are seen
AUGUST 1972



FOR INSTALLING or removing router, the cabinet is flipped on its back and the top panel is swung open

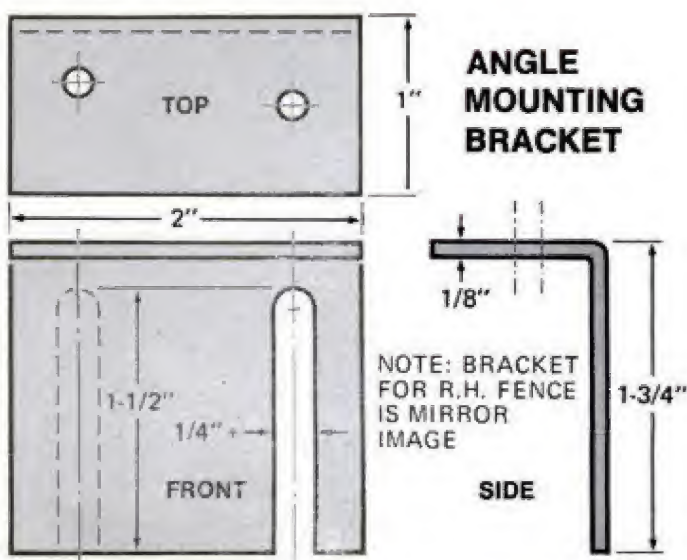
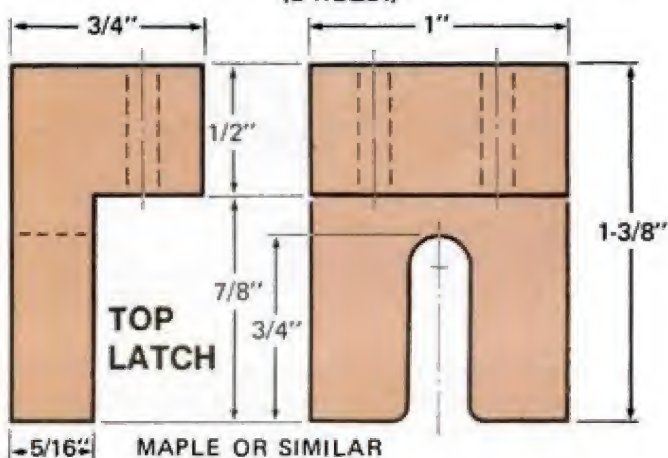
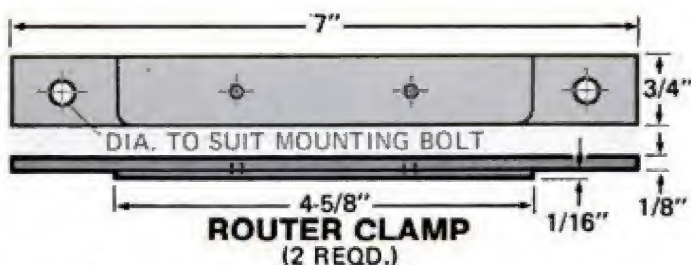
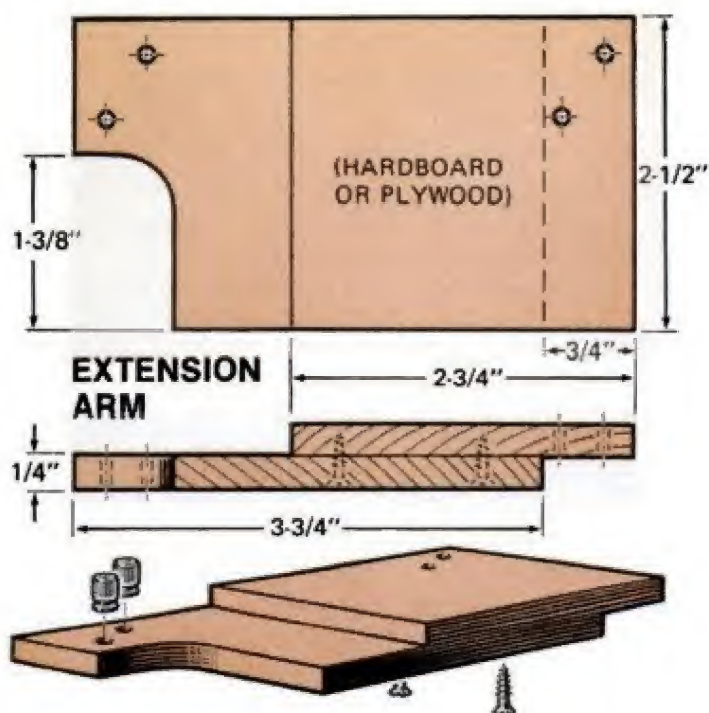


TO CHANGE CUTTERS, router is swung up and supported by dowel engaging sockets on the side panels

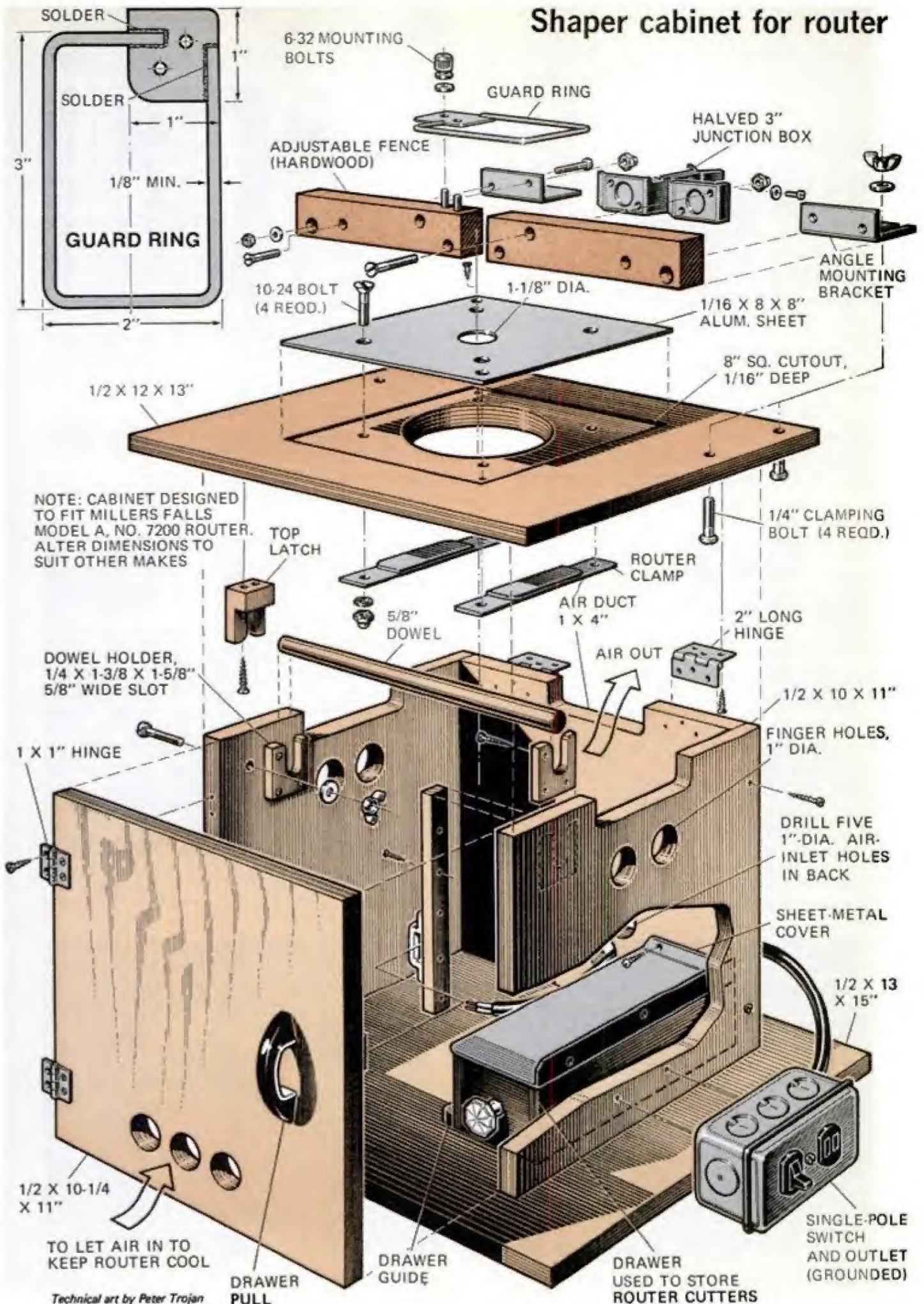
drawing air in at cord-end and discharging it around cutter, it's a must to provide airflow holes in the box. These consist of 1x4-in. notches at top edges of sidepieces and back panel and multiple 1-in. holes in back and front panels. (The two 1-in. holes at the top of each side are primarily finger holes for carrying.) If the intake air seems to carry excessive dust and chips, it's a good idea to install some fine-mesh screen over the inlets. Chips should not be permitted to build up in the box; if the router is to be used for long periods, periodically check the motor to avoid overheating. If necessary, leave the door open.

The hinged top can be raised to give better access to the router when you change cutters. The router is held in the tilted position by resting it on a piece of $\frac{5}{8}$ -in. dowel whose ends engage notched plywood pieces screwed to the inside surfaces of sidepieces.

The storage drawer is made of $\frac{1}{4}$ -in. plywood and is located in one corner of the cabinet. To keep it in position, glue a guide strip along the bottom. A sheet-aluminum cover helps keep dirt out and the drawer in place. Inside, a wooden



Shaper cabinet for router



Technical art by Peter Trojan

AUGUST 1972

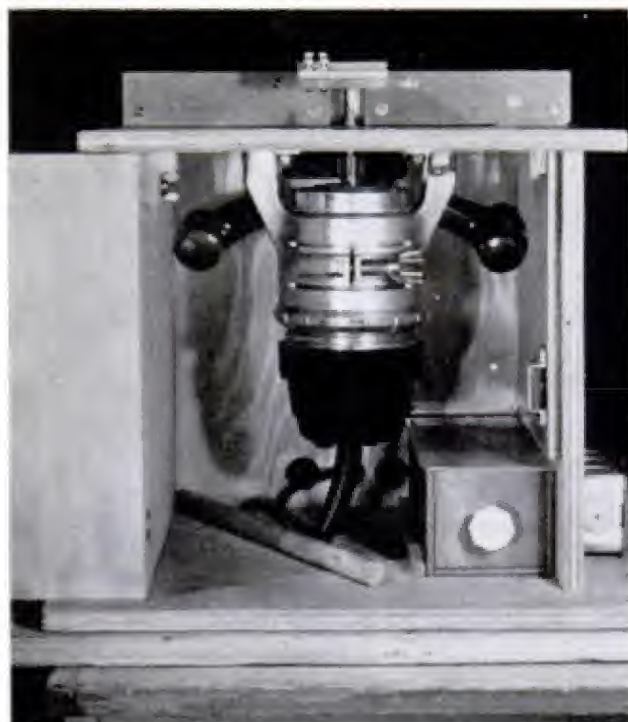
block drilled to receive cutter shanks holds stored cutters.

An adjustable fence guides straight-edged work past the cutter. I used a piece of maple cut to dimensions indicated. An angle mounting bracket was then fastened to each end with bolts.

An adjustable bracket assembly made from a 3-in. electrical junction box (sawed diagonally in two) is bolted to the fence center. A little hammering and filing will let you fit the box halves squarely with the surfaces at a right angle and parallel where they contact the wood. Three 8-32 bolts hold the two halves together: holes in one of them are slotted so the guide fence can be adjusted for cut depth when jointing.

After bolting the junction-box bracket assembly to the wooden strip, saw a section slightly over 1 in. wide from the center of the strip to provide space for the

(Please turn to page 115)



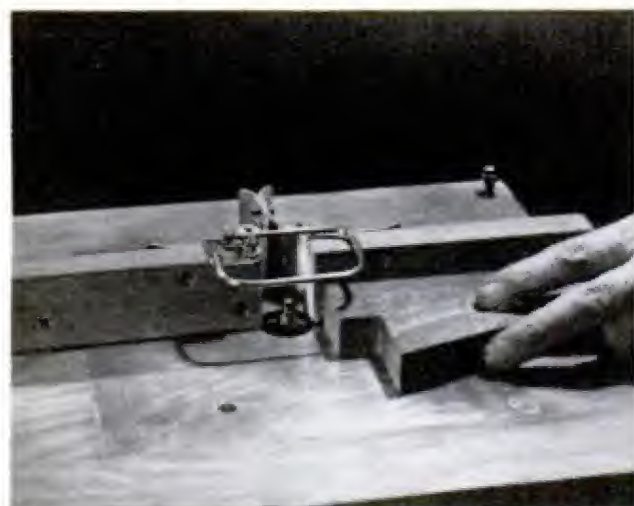
INTERIOR VIEW shows router in operating position. Plastic shield here was replaced by the ring type



MOUNTING CLAMPS and center coupling, made from a halved 3-in. junction box, are attached to the fence



REAR OF GUIDE FENCE in position for straight-edged work. Notice ring-type shield in foreground



TO SHAPE EDGES on straight work, ring-type shield is mounted on the rear fence, protects fingers



FOR CURVED WORK, guide fence is moved to back position, ring guard is mounted on extension arm

POPULAR MECHANICS

WITH THE PRICE of just about everything going up these days, my curiosity was aroused several months ago when a \$30 circular saw was introduced by Wen Products, Inc. Since the new saw had more horses and a larger blade, weighed a couple of pounds less and was priced about \$6 lower than a circular saw that I bought over 20 years ago, I wondered just how well the tool would perform.

To test the saw, I kept it on my workbench a couple of months and used it on those jobs a homeowner most frequently tackles: crosscutting and ripping two-by-stock, freehand cuts on plywood (inset photo at right below) and for conventional cutting of $\frac{3}{4}$ -in. stock, including long rip cuts with the rip fence.

I found that the saw is well balanced, easy to handle, and doesn't have to be pampered (held back) when cutting heavy stock. Though some might consider it nit-picking because of the low price, I think it is a mistake that blade-changing wrenches do not come with the tool. I

SHOP-TEST REPORT



A lightweight saw with a heavyweight punch

By HARRY WICKS, Workshop Editor

Photos by Robert D. Borst

prefer to keep related accessories with portable tools to save trips back to the shop.

To change the blade, two wrenches are recommended; a one-incher for the flange and a $\frac{1}{4}$ -in. wrench for the center bolt (arbor). The bolt, however, can be loosened using just the smaller wrench by giving it a sharp rap on its end. High-impact, shockproof Cycloc housing and convenient location of the saw's key elements (photo, right) are other features that make this saw a good buy. ★★★

MANUFACTURER'S SPECIFICATIONS

(Model 961 Circular Saw)

Motor	11-amp., 120-v., 2-hp, 5100 rpm
Blade	7 $\frac{1}{4}$ -in. dia., $\frac{5}{8}$ -in. round arbor
Depth of cut	2 $\frac{3}{8}$ in. at 90° 1 $\frac{7}{8}$ in. at 45°
Weight	8 lbs.
Price	\$29.95 (including a calibrated rip fence)
Manufacturer	Wen Products, Inc., 5810 Northwest Highway, Chicago, Ill. 60631

AUGUST 1972

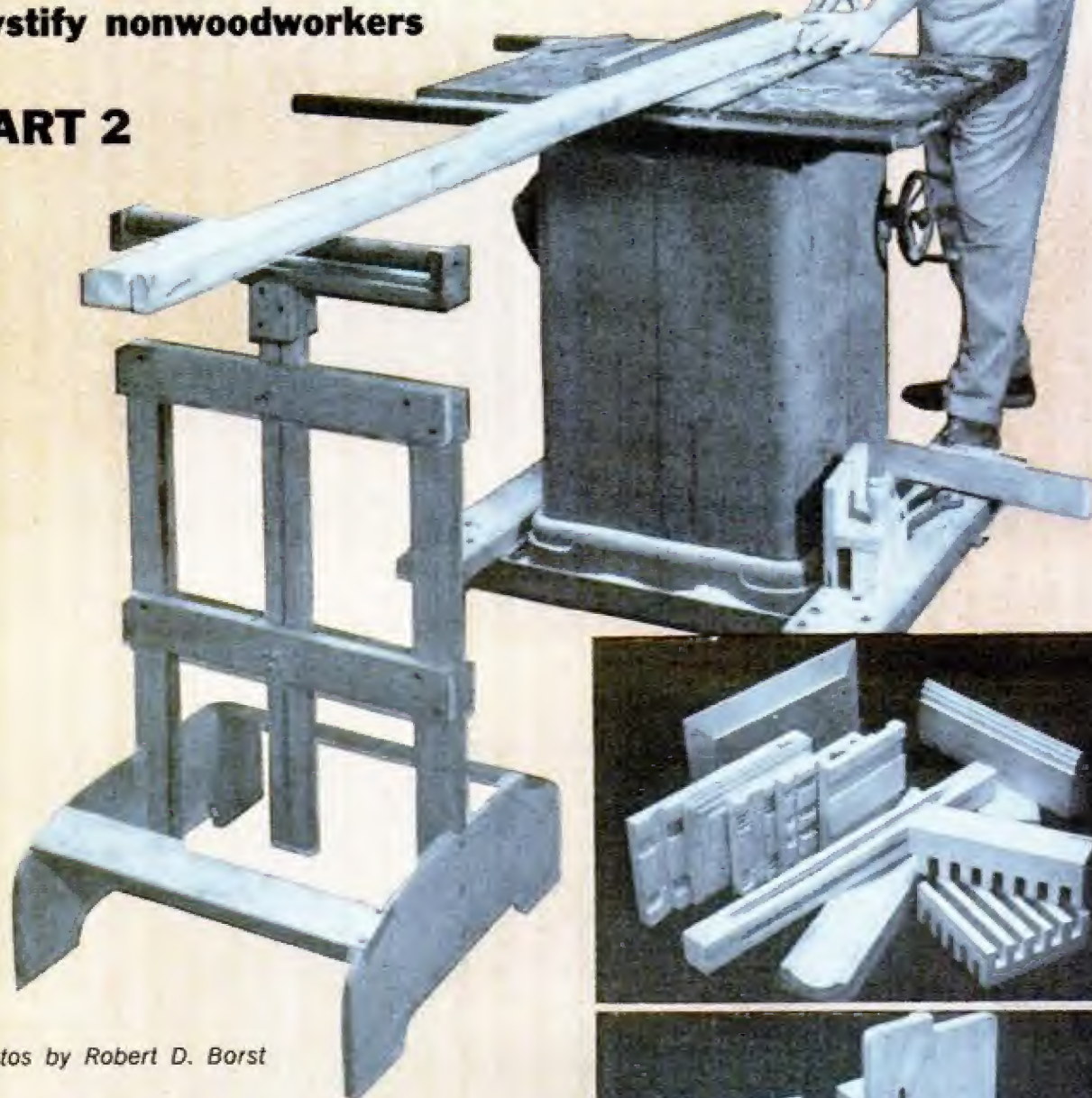
143



Bench-saw know-how

**A work-support stand you can build
... Good saw stunts ... Dado sawing
... Two simple 'projects' that will
mystify nonwoodworkers**

PART 2



Photos by Robert D. Borst

By **HARRY WICKS**, Workshop Editor

ONCE YOU KNOW the basics—and the safety rules—of the bench saw (see [Part 1, page 152, July PM](#)), you're ready for the more sophisticated sawing techniques and accessories of Parts 2, 3 and 4 in this and the next two issues. You'll learn to make such cuts and work aids as those shown in the photos at right.

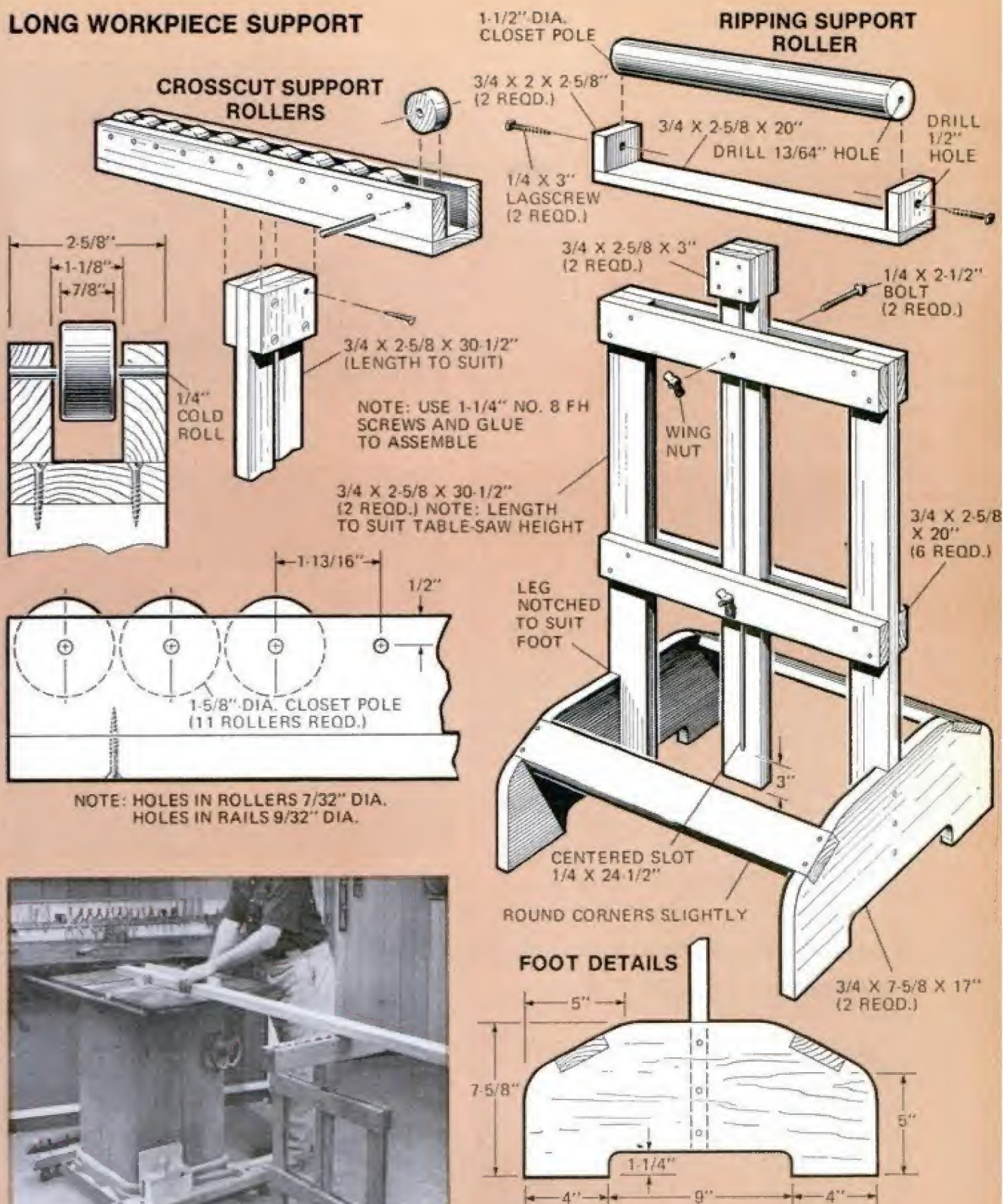
A basic rule in all power-tool woodworking is to provide the maximum support



WORK SUPPORT (lead photo) and special cuts (top) were made with tools and shop-built jigs (above). How to make them begins with Part 2

POPULAR MECHANICS

LONG WORKPIECE SUPPORT



CROSSCUTTING long pieces is simplified because support has a roller-head for this saw operation

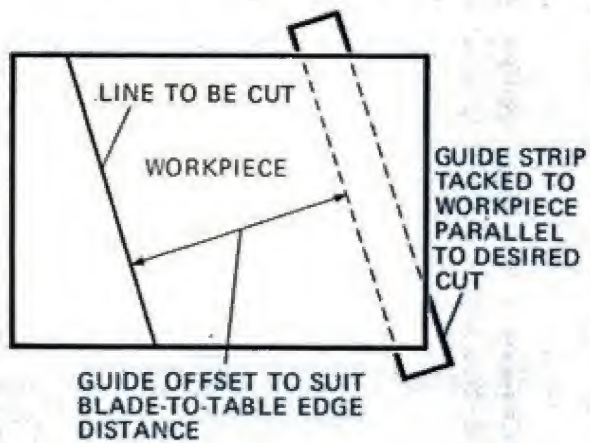
AUGUST 1972

for the workpiece. A stand for supporting long, overhanging pieces should be one of the first things you build.

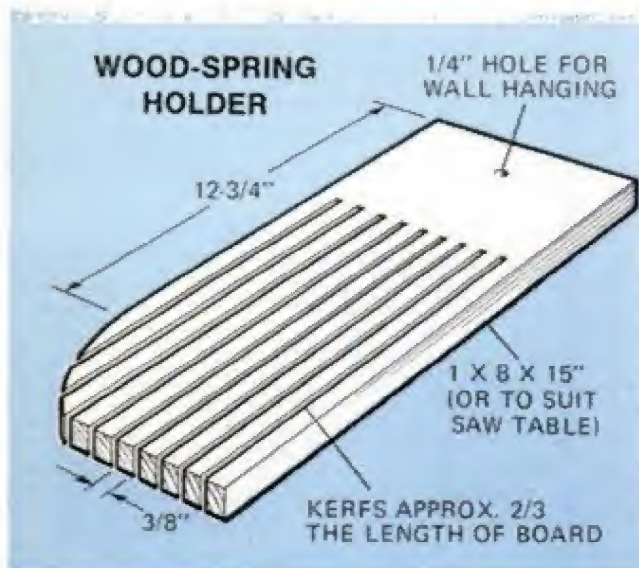
Ripping, crosscutting long pieces

Because the stand shown here is of standard, dimensioned pine, it's an inexpensive project. The support has a single-roller head for holding long boards for

Bench-saw stunts you should know

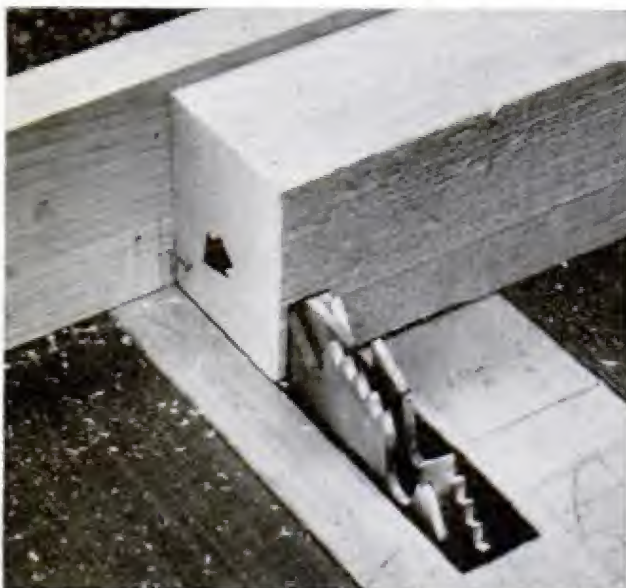


DIAGONALS can be cut on large pieces of plywood by tacking a straightedge to ride along the table edge

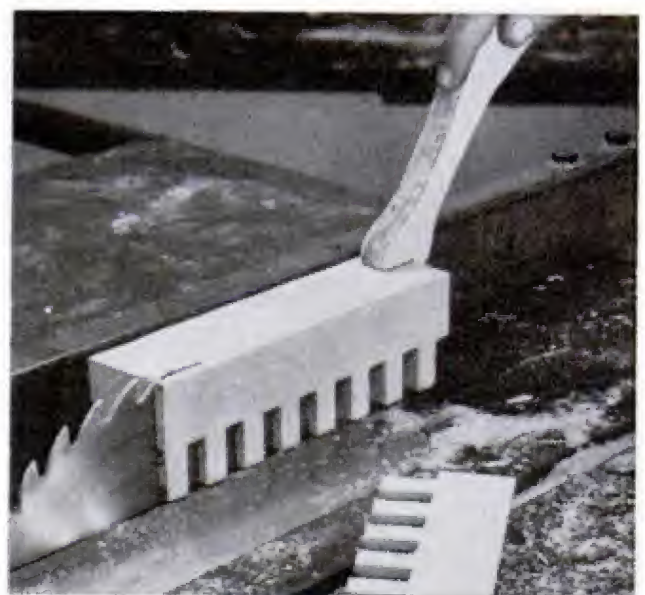


WOOD SPRING HOLDER can be made of scrap. It's always used as a work hold-in when accuracy is required

Typical dado-sawing operations



DENTIL is simply evenly spaced dados. Make first cut with end against pin; loop over pin for second



DADOED PIECE is sliced to the desired thickness—usually 1/4 to 3/8 in.—for use in trim-molding work

POPULAR MECHANICS

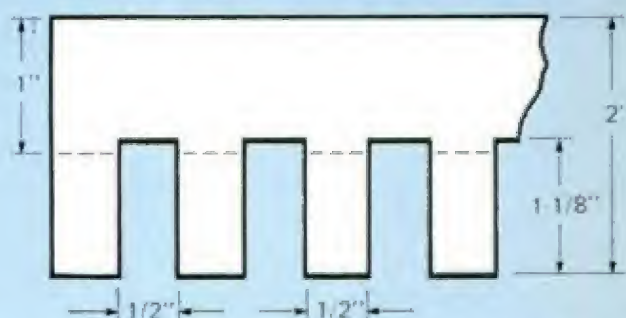


MAKING A TRIVET is good exercise in pierce-cutting and dadoing. You can practice both techniques at the same time—and wind up with a useful item

Trivet from a solid block

Here's a project that's fun to tackle once you have become familiar with your dado-head set. Making the trivet is a fine exercise in dado cutting, and your skill in cutting it—as with the "carved" tower—is sure to astound your nonwoodworking friends. Select wood that is knot-free; if you have some hardwood lying about the shop, so much the better. Pine was used for the trivet at left, and it worked well. To make it, the author used the fence and, when work was within 3 in. of blades, a pusher stick. Make the dados (across the grain) first, then flop and rotate the workpiece 90° and cut the grooves. For safety, achieve desired depth using multiple passes. To finish the piece, sand thoroughly; sanding is a must—particularly where blades exit the work. Stain the piece and use a tough finish that will withstand heat.

USE 2 X 5 1/2 X 5 1/2" STOCK (ACTUAL)



DADO ACROSS GRAIN FIRST, FLOP BLOCK AND USE SAME DIMENSIONS FOR GROOVING WITH GRAIN

ripping; a second head has multiple rollers for crosscut sawing.

Dimensions are standard except for overall height, which is determined by the floor-to-tabletop distance of your saw. (My saw is mounted on a 2x6 frame fitted with casters. Thus, floor-to-tabletop distance is above average.) Build the stand so that when the head is at its lowest position, it is lower than saw-table height. By making the stand's height adjustable, you will be able to use it when working with other tools (jointer, jigsaw or drill press). When laying out parts for cutting, check out the stationary tools you own and try to arrive at a height-variable that gives you maximum use from the stand. If necessary, shorten the four vertical legs of the stand as well as the single vertical on each head.

Rollers must rotate freely. To assure this, drill undersize pilot holes in the

closet pole and oversize, loose-fitting holes in the rails. An occasional brushing-off and a blast of silicone spray on the cold-roll and lagscrew "axles" is the only maintenance needed.

To use the stand, set the roller top surface to match the saw-table height and lock the head by tightening the two wing-nuts. As the workpiece leaves the table it is supported by the rollers and is easier—and safer—to handle.

Tongue-and-groove cutting

While a conventional rip or combination blade can make tongue-and-groove cuts, the job is best done with a dado head because it does a neater job faster. Four passes are required to cut a tongue with a conventional blade, two each for the cheeks and shoulders. The cheek cuts are made first, then the blade is lowered and waste removed by making the shoulder

cuts. To make a groove with a conventional blade requires repeat passes until the desired width is attained.

Using a dado head, the groove can be cut in a single pass and the tongue made in two. If you are gluing up narrow stock to make a wide board, do as the pros do and make the tongue slightly less than the groove depth; this trick leaves room for any excess glue to escape to.

The dado head

In wood joinery it is often necessary to cut grooves wider than the typical saw kerf. For this job a serious woodworker owns a dado head. Stated simply, a dado is a U-shaped groove. It is common practice to call this shape a dado when it's across the grain and a groove when it runs with the grain. For a deep dado or groove, it is best to achieve depth by making repeat passes, raising the cutting tool slightly and moving the fence for each pass.

Blade projection is always less than the thickness of the stock being cut. A dado (or molding head) table insert with a larger slot must be used, and work is always fed slowly.

The typical dado head comes with two blades (each with a $\frac{1}{8}$ -in. kerf) and four chippers (three $\frac{1}{8}$ -inchers and one $\frac{1}{16}$ -in.). By using these in various combinations, you can obtain 11 different groove widths. Adding paper shims between cutters increases the number of grooves you can cut even more. The blades, mounted outside the chippers, determine the groove width. The chippers clean out the stock between the kerfs.

The latest type of dado head is a one-piece unit that produces varying groove widths (which are dialed and locked-in) by wobbling as it spins. These dadoes will be discussed in a later installment.

Almost any cut that can be made with a conventional blade can be made with a dado. You can cut coves faster, for example, but the cut will not be as smooth as the surface of a cove made with a combination blade. And a cove cut with a dado will also be slightly flat at center. As mentioned above, it makes tongue and grooving operations quicker. The same is true of other cutting such as edge-rabbeting, tenoning, saucering, piercing, maximum kerfing and hollowing.

Hollowing, as in fashioning a scoop or trough, is done by making a series of

Tongue-and-groove cutting



DADO HEAD makes fast work of cutting tongues and grooves. For perfect alignment, test on scrap first



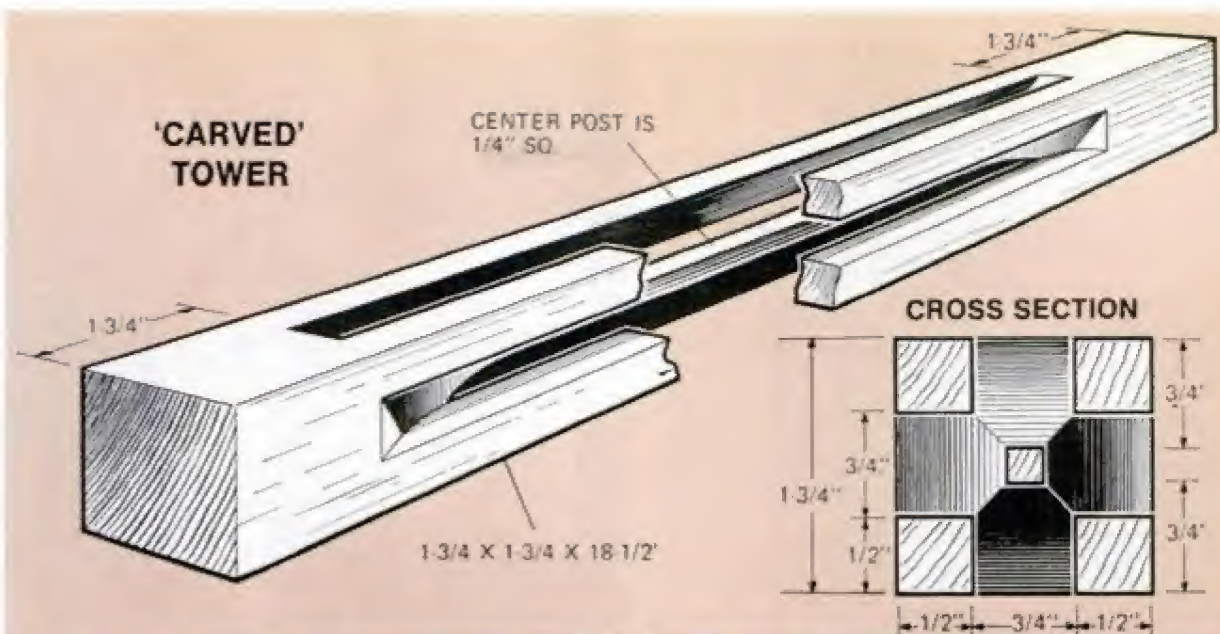
TO CUT TONGUE, fence is moved and locked. This small amount of stock can be removed in one pass

passes. After each pass, the fence is adjusted so that the cutters will overlap the last cut and the work is pushed through. Here, start and stop blocks (as in the Carved Tower, page 149), determine the length of the dado or groove.

Start and stop blocks can be clamped to the rip fence or, simply, magnetic blocks positioned on the saw table. (I prefer the latter method in most instances because it eliminates the need for a fence extension when dadoing long pieces.) Block placement is determined mathematically by raising the blade to ultimate (final) projection and putting pencil marks on the table where the cutting tool will start and stop cutting the workpiece. Blocks are then positioned relative to these marks.

Dado safety rules:

- *Never* use the chippers—or a single chipper—without the mating blades.
- Because dadoing is on the underside it is, in effect, “blind” cutting. *Never* attempt to dado freehand; always use a guide, either a fence or miter gauge.



BOARD is held against the starter block and fence, then lowered slowly onto spinning cutting tool



WHEN END OF WORK aligns with finish block, back slightly, depress leading edge to lift off

● *Never* use a dado to cut *through* a workpiece.

● As a rule of thumb, the wider the kerf being cut with a dado, the more passes—raising the cutting tool for each successive pass—you should make. Keep in mind that a considerable amount of material is being removed from the stock; a too-large bite will place an undue strain on the motor and the cutting tool. And, you. Dadoing hardwood requires even more passes than a softwood such as pine does.

● Because of that large bite, chances of kickback with a dado are much greater than with a conventional saw blade. Generally, it's best to use a work hold-down or hold-in. In many cases, both.

● To insure easy and clean cutting, keep blades and chippers sharp and, periodically, lubricate with a silicone spray during extended cutting operations.

Two exercises with your dado head

The "tower" and trivet shown on these pages are good practice projects to familiarize yourself with your dado head. Grooves for both should be made in multiple passes. To cut the tower, for example, raise the cutting tool so that it projects about

1/4 in. and cut all four sides; then raise the blade 1/4 in. each for the second and third passes. The "stop" for starting must be solid enough to press the workpiece against as you lower it. Magnetic types shown are by General Hardware Mfg. Co., 80 White St., New York, N.Y. 10013.

Lower the piece onto the spinning cutters. Push it slowly through until the trailing edge reaches the stop gauge or mark. Back up the piece slightly, put pressure on the leading edge and lift off the piece. Repeat procedure for the remaining three sides. Make the trivet with at least three passes. Cut the dados first, then the grooves. Both pieces are examples of pierce-cutting as well as dadoing; that is, cuts from opposite sides intersect, without going through the workpiece, to produce a see-through effect. Both also prove why it is a must to keep dado-cutting tools razor sharp. Dull ones make the job difficult and unsafe.

The tower could be used as an integral part of a leg, or, sprayed with Da-Glo paint, as "pop art." The trivet makes a handsome protective base for hot pots.

Next month: Use of the molding head and some of the available cutters. ★★★

EXCITING NEW PRODUCTS

BY CATHERINE BILSKI



THINGS WON'T BOUNCE OUT when carried in the 12-in.-deep bike basket shown above. Support and spring clamps are designed to fit all shapes of handlebars. The basket mounts easily on all bicycles—lightweights, middle-weights and sports models, 20, 24, 26 and 27 in. Capacity is 840 cu. in. Model No. 183 (shown) sells for \$2.98 by Androck Co., Div. of Roblin Hope's Industries, Inc., 28 Union St., Worcester, Mass. 01608.



A PRACTICAL take-along concept in writing desks, Tote Desk (below) is ideal for the businessman who travels. It's also handy for bed patients. Molded of polypropylene plastic with a convenient built-in handle, it can be used as a suitcase, toolbox, briefcase or book carrier. A transparent flat top serves equally well as a lap writing desk, hobby tray or game table. Retail for \$5.95, made by Peabody/Mutschler, North Manchester, Ind. 46962.





A COUNTERTOP APPLIANCE providing cooking convenience and flexibility is the Savory Centre Drop-In Combination (Model 2855). It combines an electric range and continuously cleaning oven with built-in grill. Smoke and odors from all three are vented outdoors. Optional accessories convert grill to rotisserie, shish kebab, deep-fat fryer or nonstick griddle. \$249 from Jenn-Air Corp., 3035 Shadeland, Indianapolis, Ind. 46226.



VIOLINMAKING is a fascinating and rewarding hobby, and now you can make one from a kit. Three different kits (A, B or C) come unassembled but complete with everything you'll need from seasoned, tone-wood tops and backs down to superb oil-varnish and fine polished strings. Graded according to quality of wood, prices range from \$90 to \$129. Made by Scherl & Roth, Inc., 1729 Superior Ave., Cleveland, Ohio 44114.



CREATE OLD PUB ATMOSPHERE in a family room or den with these oak miniature "whiskey" barrels. Barrel Bank, at left, is 6 in. high and 4 in. wide, has four brass hoops and key, holds up to \$200 in coins. The usable 1-gal. Bar Keg, at right, has four chrome hoops and comes with plug, spigot and stand. They sell for \$7.50 and \$8.50, respectively; are made by Sweeney Cooperage Ltd., 1341 North Northlake Way, Seattle, Wash. 98103.

AUGUST 1972

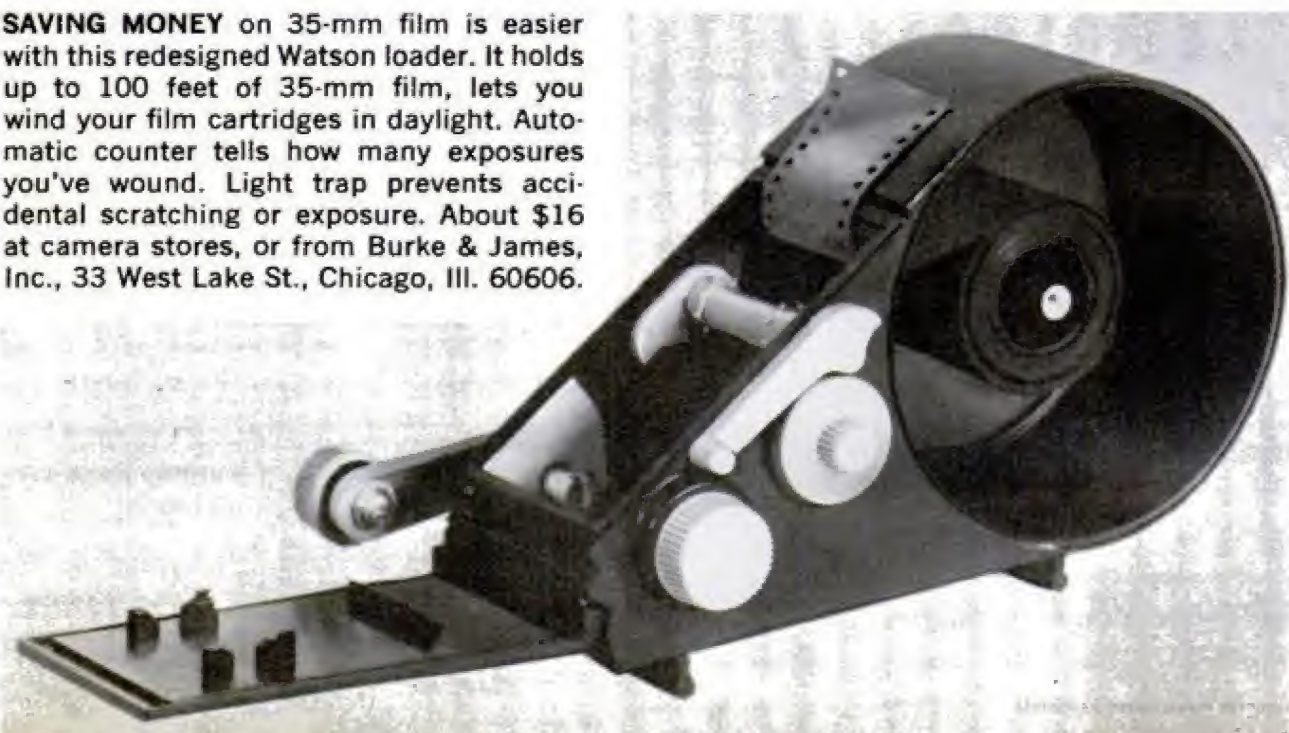


YOU CAN DO SOMETHING about air pollution—at least in your home. The Air Care Cleaner developed by the West Bend Co., West Bend, Wis. 53095, effectively removes up to 99 percent of all pollen and up to 90 percent of all airborne dust, smog, smoke and odors from the air that passes through it. The unit is designed to look like a piece of furniture to complement any decor. It retails for less than \$200 ready to plug in.

NEW IN PHOTOGRAPHY



SAVING MONEY on 35-mm film is easier with this redesigned Watson loader. It holds up to 100 feet of 35-mm film, lets you wind your film cartridges in daylight. Automatic counter tells how many exposures you've wound. Light trap prevents accidental scratching or exposure. About \$16 at camera stores, or from Burke & James, Inc., 33 West Lake St., Chicago, Ill. 60606.



COMPACT, ECONOMICAL new Durst 35-mm enlarger makes 11x14-inch enlargements on its baseboard, can be turned to make even bigger blowups on your floor or wall. Color or variable-contrast filters fit a built-in drawer. Enlarger can be taken down in minutes for storage in a drawer or elsewhere. Model F30, \$49.50 less lens. Durst Div., Ehrenreich, 633 Stewart Ave., Garden City, N.Y. 11530.

NEW LINE of five compact electronic flash units from Keystone runs from under-\$20 model shown to a quick-charging, computer-automatic flash just under \$70. All models feature color-corrected tubes, hidden sync cords, rear-mounted controls, three-position mounting shoes, and two-year guarantee. Keystone, Keystone Pl., Paramus, N.J. 07652.



Today, a man needs a good reason to walk a mile.

Start walking.



Warning: The Surgeon General Has Determined That Cigarette Smoking Is Dangerous to Your Health.

25 mg. "tar," 1.5 mg. nicotine av. per cigarette, FTC Report APR. '72.

Camel and the camel logo are registered trademarks of R.J. REYNOLDS TOBACCO COMPANY.

A beauty—and so simple to make

Inexpensive 'hand-carved' panels glued to sides give this octagon lamp table a handsome \$100 look

By WAYNE C. LECKEY, Home and Shop Editor

Photos by Robert D. Borst



Table lamp by Phil-Mar

NOTHING GIVES home-built furniture the look of elegance more quickly than molded reproductions of hand-carved panels. A good example is this handsome lamp table. Team up the panels with decorative laminate and a portable router, and your workshop project will stack up with the best in any furniture store.

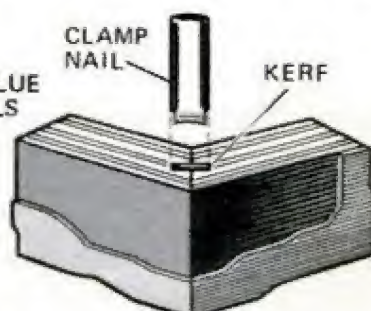
Prefinished molded reproductions used in this table are like those that added a rich hand-carved look to the roll-out buffet bar (*A handsome buffet that leads a double life*, page 140, Dec. '71 PM). As in that case, the table begins as a plain plywood shell. But when exposed plywood surfaces are covered with wood-grain decorative laminate and molded panels are added to all eight sides, your piece will look anything but homemade.

To start the octagon base, cut eight 10x20 $\frac{1}{4}$ -in. panels from $\frac{3}{4}$ -in. fir plywood, but don't bevel the edges. Next cut and cement pieces of decorative wood-grain laminate to the panels—top, bottom and center—as indicated below. The center piece can be scrap. Use contact cement to stick the laminate flush with the edges and run the grain crosswise. When applying the cement, be

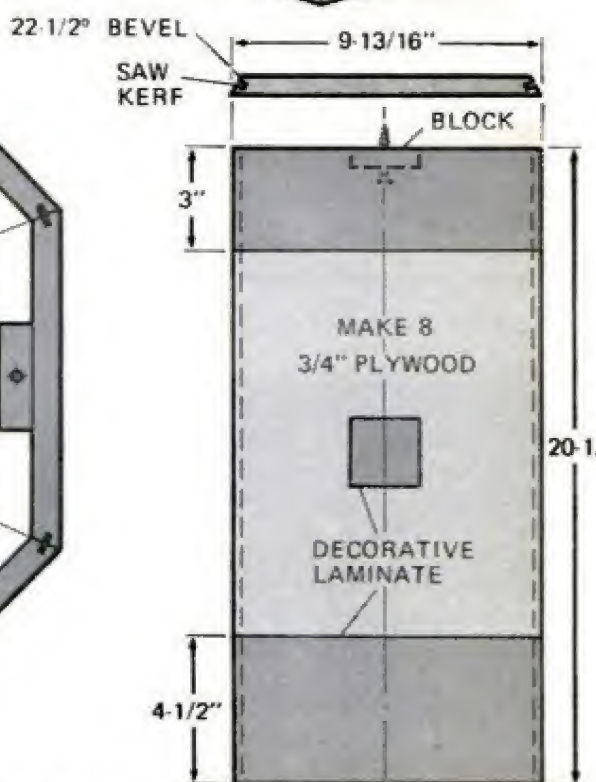
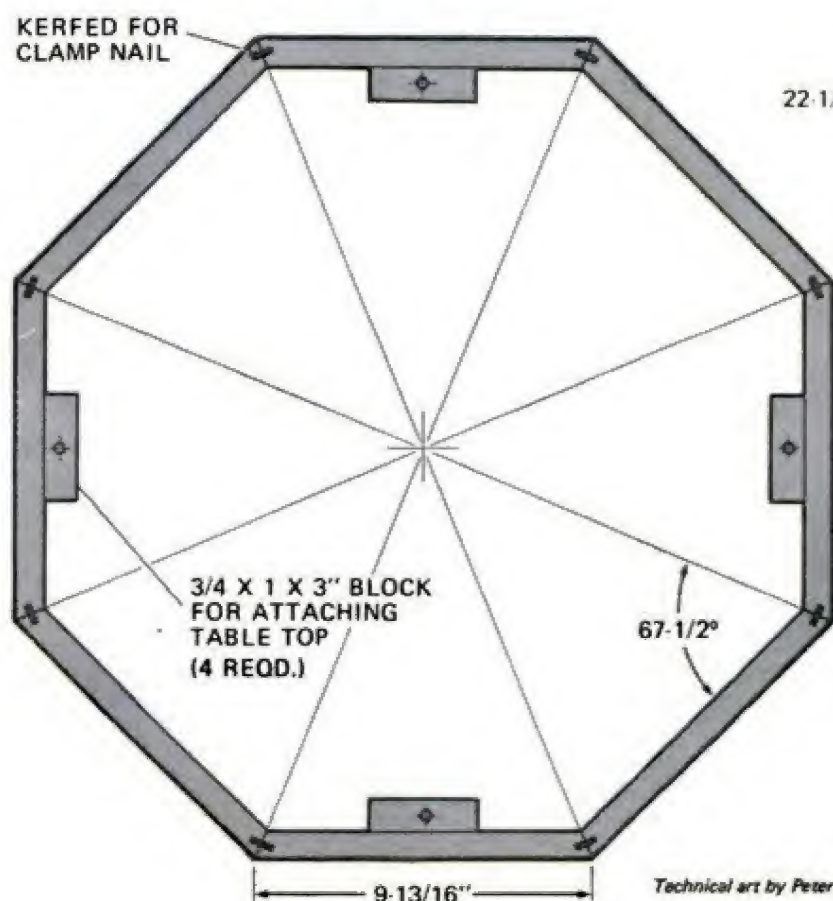


BOX NAILS ARE USED in addition to clamp nails when you assemble the shell; drive nails at an angle

PANELS ARE JOINED USING GLUE AND CLAMP NAILS

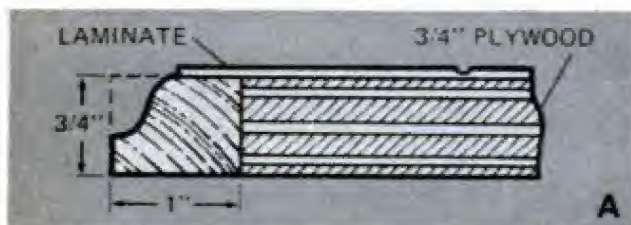
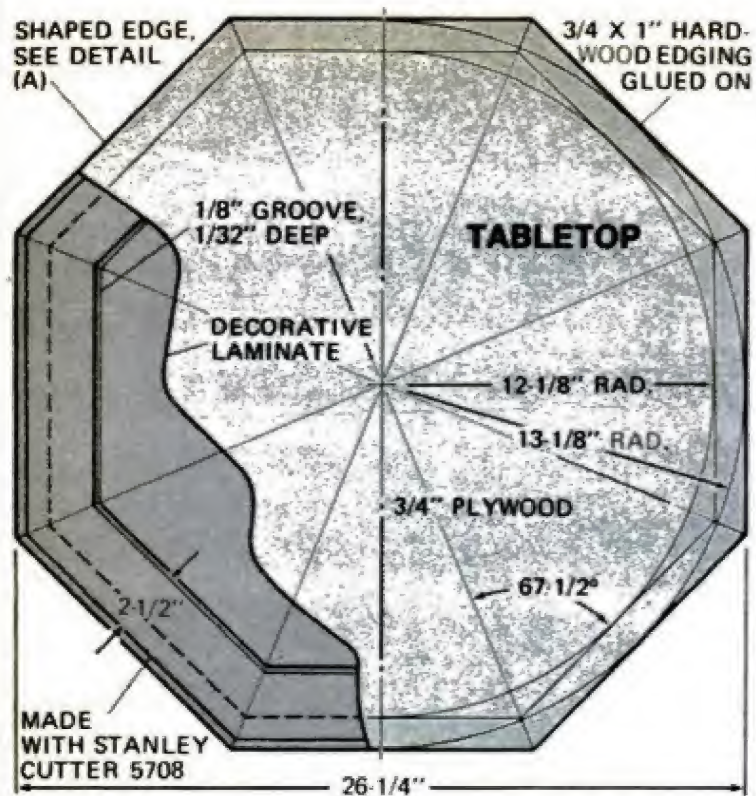


TOP VIEW OF BASE



TYPICAL SIDE PANEL
(8 REQD.)

Technical art by Peter Trojan



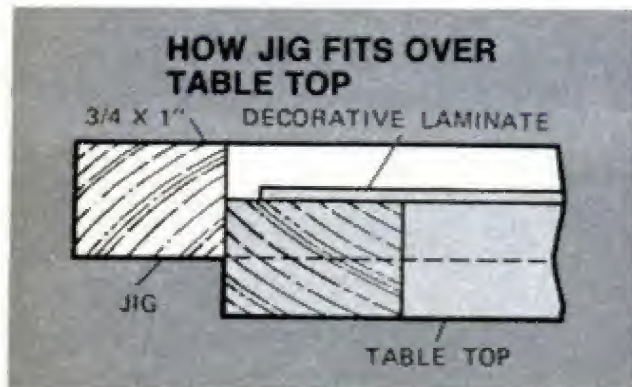
sure to follow the directions on the can.

Tilt your table saw to cut a $22\frac{1}{2}^\circ$ (or $67\frac{1}{2}^\circ$) angle and slowly bevel the two side edges on each panel. Use a carbide-tip blade so you won't chip the laminate. Finished width of each panel should be $9\frac{13}{16}$ in.—actual width of molded panel.

Special clamp nails, hammered into saw kerfs, are used to assemble the eight into an octagon shell. To cut kerfs in the beveled edges, return the blade to 90° , set it for a $\frac{1}{4}$ -in.-deep cut and run a kerf ($\frac{1}{8}$ in. wide) full length down the center of the bevel. Hold the plywood with the

(Please turn to page 174)

WOOD RING clamped to perimeter of top provides fence for router for making $\frac{1}{8}$ -in. groove in laminate



BAND OF CONTACT CEMENT is applied to laminate along edge of masking tape with a small paintbrush



CONTACT CEMENT IS APPLIED also to back of carved panels at the center and along top and bottom edges



WHEN CEMENT IS DRY to the touch (about 20 minutes), carved panel is positioned, lowered into place



MOLDS

for making
Ornamental Concrete
Items...

Book about Aluminum
Molds with prices and
production trade secrets
direct from world's largest
concrete mold manufacturer.



SEND
\$2.00

CONCRETE MACHINERY COMPANY,

INC.

P. O. BOX 99 • HICKORY 2, N. C. 28601

I-N-V-E-N-T-O-R-S WE NEED INVENTIONS

Sell your invention for cash—need money for Patent?—Are technical problems holding you back? Universal Inventions has helped inventors all over the world—just like yourself—why not you? Inventions provide the magic spring-board to sudden riches. REMEMBER, we either sell your invention or pay you a cash bonus. Write for details. UNIVERSAL INVENTIONS, Dept. 13, Marion, Ohio

HELPS DRAW OUT BOILS

Here's quick, proven relief when unsightly and painful boils make you feel miserable. Soothing BOIL-EASE with 7 medicated ingredients helps reduce swelling and pain. Protects against infection, so you look and feel better fast.

BOIL-EASE®





MAKE \$20 to \$30 A WEEK EXTRA MONEY

Here's a practical way to increase your income and build security for your family. Earn extra money every week sharpening saws with a Foley Automatic Saw Filer. You can actually build your own business with it—without special training or previous experience.

TURN YOUR SPARE TIME INTO CASH. Make from \$3 to \$6 an hour evenings, week-ends. Start in your basement or garage. No canvassing. "I advertised in our local paper and got in 53 saws"—says M. L. Thompson. Every saw you sharpen with the Foley Filer brings you more customers. Hundreds are making extra money this sure, fast, easy way. You can too.

**FREE
BOOK
SHOWS
YOU HOW
TO START**

"Money Making Facts" explains how you can get business from home owners, farmers, carpenters, schools, factories, etc., how to build your business and expand—every step of the easy way. Don't wait. Mail coupon now for this exciting book and easy pay plan. No salesman will call.

MAIL COUPON FOR FREE BOOK

FOLEY MANUFACTURING CO.
843-2 Foley Bldg. Minneapolis, Minn. 55418
Rush free book, "MONEY MAKING FACTS", and details on easy pay plan.

Name _____
Address _____
City _____ State _____



WRIST ROCKET®

AMERICA'S
HARDEST
HITTING SLING
Range 225 yd.—232 fps.
Matched replacement rubbers and
LEATHER pouch assembly \$1.00
At dealers or order direct.



WRIST ROCKET® Mfg.
P.O. BOX 21-B
Columbus, Nebraska 68601

\$3.00

Post. Pk. in U.S.A. No C.O.D.'s
Orders outside U.S.A. add \$1.50
for postage and handling



Do-It-Yourself Siding

Learn how you can earn up to \$1000.00 for a single order showing our quality aluminum, steel, and vinyl siding on your home. Small investment required for your own siding. No further investment. Mail coupon for free information without obligation.

**ALUMINUM INDUSTRIES
of ARKANSAS, Dept. P-82
Little Rock, Arkansas 72205**

Please send me free information concerning your quality do-it-yourself kits.

name _____
street _____
city _____ state _____ zip _____

SAILING FASTER than the wind seems impossible—like getting something for nothing.

Yet thousands of boats can do this, though most skippers do not fully understand why or how. Iceboats can sail about four times the speed of the wind that drives them. Racing catamarans can do about 1.2 times the speed of the wind and future multihull designs may get up to twice the speed of the wind. Some planing monohulls can go faster than the wind, too.

But keel boats, no matter how slick or how expensive, can never equal the speed of the wind, let alone go faster.

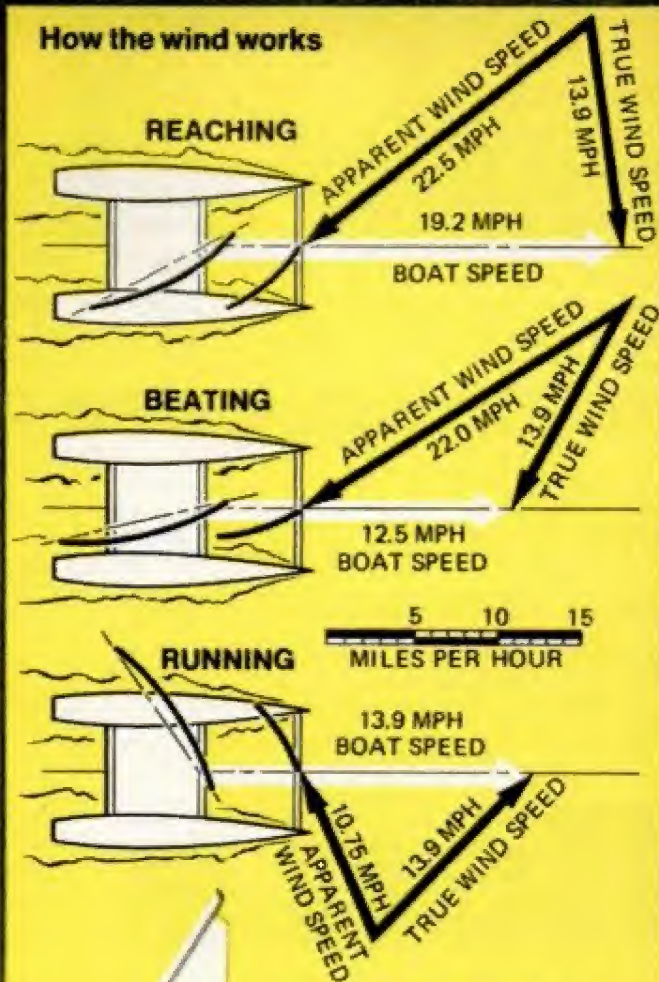
Why is this?

There is a general misunderstanding that sailboats move only because the moving air pushes them downwind. It seems illogical that an object could move faster than the force moving it.

That was true in the days of old square riggers and before man learned to sail into the wind. But now the answer involves the difference between the true wind velocity and the apparent wind velocity.

True wind seems obvious enough. It is simply the speed of air passing a fixed point. It may shift around a bit, but it

How the wind works



BROAD REACH gives racing catamaran highest speed, as shown by the vector diagrams

HOBIE CAT, from Coast Catamaran, San Juan Capistrano, Calif., has been officially clocked at 26 mph

Faster than the wind

Efficient sails and multihulls make some boats swifter than the breezes that push them

By N. M. IYE





HEAVY DUTY WELDER

with special \$7.00 gift offer to
Popular Mechanics readers

10-DAY FREE TRIAL
Lifetime Guarantee

Brand New **1895**
1972 Model **1895** POST
PAID

Fits ordinary 110V outlet
Not one • but 6 welding heats

WELD
WITH
WEL-
DEX

Weld, braze, solder or cut most anything made of metal. No experience necessary. Follow simple instructions to make repairs on cars, trailers, farm and lawn equipment, bicycles, appliances, etc. Make campers, boats, furniture, hundreds of valuable items. **NOTHING ELSE TO BUY!** Comes complete with full face shield, pack of welding and brazing rods, heavy duty power cables, special electric torch attachment, ground clamp, flux, easy-to-follow illustrated instructions, rod holder, etc. Uses standard $\frac{1}{4}$ " rods to weld iron, steel, brass, bronze, aluminum, other metals. New improved HEAVY DUTY circuit gives more welding power. Gives 4 times the heat needed to melt toughest iron. Plugs into ordinary 110V outlet. 6 WELDING HEATS plus continuously variable carbon-arc heat regulation control lets you weld anything from "tough" jobs to light-weight metals with ease. This important feature saves you money and time. Makes it possible for even beginners to start welding professionally the very first day. Pays for itself quickly. An excellent gift for any occasion. IT'S AUTO-MATIC: Current is turned ON when arc is struck, OFF when rod is lifted from work. Eliminates need for troublesome foot switch. Speeds up work.

FREE! Mention that you saw this ad in Popular Mechanics and receive a \$7.00 gift pack assortment of "touch weld" welding rods. Automatic arc striker. Weld with "push button" ease. Lifetime guarantee.

10 day MONEY BACK GUARANTEE. You must be satisfied or return for refund. Send only \$2.00 and pay postman \$16.95 plus postage when delivered or send \$18.95 cash, check or money order for immediate postpaid shipment.

WEL-DEX MFG. CO., Dept. W-203, Box 10776, Houston, Texas 77018

HOW TO GET RICH -- AT HOME!



There is no other business like mail order. Start on a shoestring in your spare time and make a fortune fast. It strikes like a bolt of lightning! Millions read your ad and suddenly you are swamped with cash orders from all over the country. **MORE MONEY** in 60 days than you could earn in a lifetime! Write for free book and complete details. Mail Order Associates, Inc. Dept. 225, Montvale, N.J. 07645

BENSEN



So stable it
flies hands off!

EASY TO BUILD AND FLY — MOST FUN, TOO!

Enjoy the exhilarating thrill of personal flying in the world's most popular homebuilt aircraft, the Bensen Gyrocopter. Store it in your garage, go aloft when you like — high and fast or low and slow. Send \$5 for Copter (\$3 for Glider) colorful "Info Packet", with 3-View Drawings; General Specifications; Design Information; Construction Hints; in-flight photo; 6-page "Bulletin" with numerous pictures plus descriptions of Plans, Kits, Engines; Condensed Price List . . . and a Certificate for \$5 (or \$3) toward the purchase of Construction Plans.

SEND
\$5
OR
\$3

BENSEN AIRCRAFT CORP., Dept. PM-82

RDU Airport, P. O. Box 2746, Raleigh, N. C. 27602

NAME _____

ADDRESS _____

locksmithing and key making

PRACTICAL UP-TO-DATE COURSE — ONLY \$7.95



Teaches you how to pick locks, de-code, make master keys, repair, install, service, etc. New self-instruction lessons for every handyman, homeowner, carpenter, mechanic, service station operator, fix-it shop, hardware dealer, gunsmith. 53 easy illustrated lessons. Full price only \$7.95 postpaid. Satisfaction or refund guaranteed. Mail order today!

NELSON-HALL CO., Dept. HY-2
325 W. Jackson Blvd., Chicago 60606

DANDY DRAWERS

EASY SLIDERS

\$8.60
SPECIAL OFFER

Build Your Own Custom Installations and SAVE!

Ease your storage problems with the easy slider, DANDY DRAWERS. Just cut a slot (kerf) in your standard size 6 in., 8 in., 10 in., or 12 in. lumber for the two side lips which give this unique drawer full length support. It's that simple!

Thousands of uses in the kitchen, garage, camper, kids' room, industry, etc.

- | | |
|---|--------|
| <input type="checkbox"/> 6 Large DANDY DRAWERS (11 in. x 7-3/4 in. x 2-7/8 in.) | \$8.60 |
| <input type="checkbox"/> 12 Regular DANDY DRAWERS (9 in. x 5-3/4 in. x 2 in.) | \$8.60 |
| <input type="checkbox"/> 18 Small DANDY DRAWERS (7-3/16 in. x 4-7/16 in. x 1-1/2 in.) | \$8.60 |
| <input type="checkbox"/> 24 Dinky DANDY DRAWERS (5-3/16 in. x 3-7/16 in. x 1-1/8 in.) | \$8.60 |

STACK

UNDER BENCH



DEALERS INQUIRIES
INVITED



BAUMBACH ENGINEERING CO. INC.

Dept M-82 • 126 Calderon St. • Mountain View, Calif. • 94040

PLEASE SEND: (CHECK ONE OR MORE)

- | | |
|--|--|
| <input type="checkbox"/> 6 LARGE DANDY DRAWERS \$8.60 | <input type="checkbox"/> 18 SMALL DANDY DRAWERS \$8.60 |
| <input type="checkbox"/> 12 REGULAR DANDY DRAWERS \$8.60 | <input type="checkbox"/> 24 DINKY DANDY DRAWERS \$8.60 |

ENCLOSED IS \$ _____ CASH, CHECK, OR M.O. — NO C.O.D.

NAME _____

ADDRESS _____

CITY _____

STATE _____

ZIP _____

ALL DRAWERS MAILED POSTPAID IN THE U.S.A. CALIFORNIA RESIDENT ADD 5% SALES TAX.

MY COLOR
PREFERENCE IS:
☐ RED
☐ BLUE
☐ GREEN
☐ YELLOW
☐ MIXED



HIKING OUT on one flying hull of a swift Hobie Cat in a brisk wind is the designer of the boat, Hobie Alter

usually has a general direction or heading.

Apparent wind is something else. Suppose you are walking or running. On a calm day you will feel the wind directly in front of you. But suppose there is a 10-mile wind blowing from your right. As you run forward at about 5 mph, you will feel the apparent wind shift to the right front quarter of your face. You know the wind is still coming from the right, but adding in your forward speed makes the apparent wind shift up ahead—so it comes in from a forward, as well as side, angle. If you increase your forward speed and the side wind stays the same, the apparent wind shifts even farther ahead.

This is what happens with a boat. With an iceboat the runners traveling over a hard, slick surface meet little resistance going forward. With a sailboat the hull must displace water that is heavy and also meet friction resistance caused by its wetted surface. Keeping the boat light so it displaces a minimum of water and reducing the area that is wet make it possible for a boat to move faster. Keelboats, even sophisticated ones, are weighty, so displace equally large weights of water and put up substantial frontal area resistance as well. The combination makes it impossible to outspeed the wind.

But with lightweight, highly-streamlined catamarans the story is different. Since the hulls skim the surface, the faster they go the faster the apparent wind becomes. Even when going downwind,

iceboats and racing catamarans tack from side to side to get the most speed from the apparent wind. The result: Even though the total distance from side to side is much greater than the straight-line distance downwind, they can cover the straight-line distance in less time than if they merely drifted.

As diagrams on page 158 indicate, the highest apparent winds are achieved on a broad reach, and as the speed builds up and the apparent wind moves forward, the fastest heading of the boat moves away from the true wind. At its highest speed the boat is actually going away from the true wind but still into the apparent wind. All the time the angle of the boat to the apparent wind stays almost the same, no matter what the course is in relation to the true wind. At its best speeds, the angle of an iceboat may be 10° to 20° off the apparent wind.

More exciting are relative speeds. For an iceboat, speeds up to 50 or 60 mph are possible with winds of only 15 mph. On a conventional sailboat, speeds to 6 mph are possible with 10-mph winds. High-performance catamarans have reached 35-mph speeds with 25-mph winds.

This last figure points up the drag of water friction that holds a sailboat back. Possibly when hydrofoils and more advanced sails are developed, the relative speeds of waterborne boats will approach the almost dragless efficiency of iceboats and even soaring gliders. ★★★

Home shop tip from Loctite.

**THIS IS ONE WAY
TO LOCK A NUT
ON A BOLT.**

THIS IS A BETTER WAY.

Better because it makes the assembly vibration-proof.

Lockwashers or locknuts *can* come loose. Loctite-sealed assemblies can't . . . until you want them to. And then, because Lock N'Seal also seals out rust, disassembly's easier too. Ask for Lock N'Seal at your auto parts or hardware store.

LOCTITE®

Loctite Technology . . . the better way to hold parts together.

GET S-E-T...GO!

Roland Leong and the Mac's Hawaiian are a winning combination on the Funny Car circuit.

Now Mac's has a winning combination for your car. Mac's S-E-T Super Engine Treatment products.

Mac's S-E-T Gasoline Booster keeps the fuel system clean including emission devices, boosting power.

Mac's S-E-T Carburetor Tune Up improves performance as it cleans and lubricates carburetors, automatic chokes and P.C.V. valves.

Mac's S-E-T Oil Booster retards wear, rust and corrosion in engines and meets all manufacturers' standards.

Available at service stations and your NAPA or independent jobber.

MAC'S

AUTOMOTIVE CHEMICALS



Story behind the stern drive

Today there's a
wide choice of
prices, horsepower

By JIM MARTENHOFF



PROTOTYPE Volvo I/O is demonstrated for Great Britain's Prince Philip and party after Miami-Nassau test. Inventor Jim Wynne wears white cap, PM's Bill McKeown is handling the stern lines and yachtsman Skip Allen is riding the 17-foot Thunderbird bow



HOTTEST OFFSHORE MACHINES, the Don Aronow Cigarettes, use stern-drive power. Rautbord's Fino mounts 525-hp MerCruisers

MOST BOATMEN call it the stern drive. Others prefer outdrive. Some say it is an inboard-outboard, a hyphenated mouthful usually abbreviated to I/O, pronounced "eye-oh." It's also been tagged with short and ugly titles when it misbehaves, usually as a result of careless maintenance by the owner. But hordes of happy skippers consider it the best of two propulsion worlds—a powerplant with the combined advantages of an outboard-drive unit and an inboard engine. A look at its features may indicate that it would be best for your boat, too.

That's what Miamian Jim Wynne had in mind when he began working on the idea in 1958. He had graduated from MIT with a master's degree in 1953, worked five years for Mercury testing outboards at its proving grounds in Wisconsin and Florida, and then returned to his home town as an independent marine engineering consultant. He had seen inboard-outboard combinations before, he recalls, but none had been successful. "They didn't do everything an outboard motor could do, yet it seemed like there could be a good market for something that combined the best features of an inboard engine and an outboard lower unit."

Wynne wanted to mate the four-cycle inboard with the outboard's tilting and steering propeller. The four-cycle engine, he felt in 1958, offered better fuel consumption, no smoke, better idling. "Outboards have improved considerably since then," he notes, "but at that time the two-cycle engine was still a somewhat temperamental fuel gulper and prone to smoking and plug-fouling at idling. Plus, you could get more horsepower with an inboard."

He also felt it would be desirable to get the engine inside the boat where it was more accessible for repairs and maintenance: get it out of the salt spray that plagues big outboards hung over transoms, and eliminate a cut-down stern that could swamp a boat. Yet



1930 STERN DRIVE, from Johnson Outboards and Penn Yan Boats, came too soon and was depression victim

a new rig should retain great advantages of the kicker—maneuverability, since it steered with the power thrust from the propeller rather than a rudder; plus tiltability, whether striking an obstruction, beaching the boat or loading it on a trailer.

The idea had seemed logical to other inventors, too, but the predecessors Wynne knew of all seemed to lack something: they didn't tilt, or had steering problems, weren't reliable or introduced too much torque into the steering system. Wynne decided to use a double universal joint in the drive to permit transmission of power even with a unit that tilted and swung side to side, somewhat similar to the arrangement for front-wheel-drive cars.

In February, 1958, Wynne cobbled up a unit in the garage of his Miami home. He was 28, with no money coming in, so he worked single-handed, and somewhat secretly. "I used the lower unit and driveshaft housing of an outboard, welded some plates on top of it to take a right-angle gearbox, bought a universal joint, welded up a frame to mount the whole thing on a transom, and looked around for an engine," Wynne remembers. The little Volvo Penta was available as a straight inboard and he ordered one without the marine reverse gear, which intrigued the home office in Sweden.

Wynne borrowed a boat from the late Woody Woodson, founder of Thunderbird Boats, and single-handedly installed his new drive. "Early one morning when no one was around I launched it at Pelican Harbor, fired it up, and it performed well,

steered nicely and did everything I'd hoped for." For only five minutes. Then Wynne's rubber boot around the universal joint, improvised from an inner tube, tore open. But first problems were very minor and he got 25 to 30 mph from the rig.

Later that year Jim Wynne went to Denmark to join boatbuilder Ole Botved in an attempt to cross the Atlantic in an outboard-powered boat. Botved was hanging a pair of Johnson 50-hp outboards on his 22-foot Coronet, but Wynne took time out to visit Sweden and Harold Wiklund, then as now the president of the Volvo Penta division of the giant Volvo corporation. After two days Wynne signed a contract for production of his stern drive and recalls that Wiklund thought him wildly optimistic in his estimate that 1500 stern drives could be sold in a year.

Then Wynne returned to Denmark and set out across the Atlantic. Their little boat ran near a freighter and had to be hoisted aboard briefly during a bad storm.

"It was a plenty hairy Atlantic passage," Wynne recalls, and still has a dapper red beard as a souvenir of the crossing. "The trip couldn't have improved my credibility with Volvo either; here was some nutty American with a stern-drive idea crossing the Atlantic by outboard."

The rest is history. Volvo developed a running prototype, introduced it at the 1959 New York Boat Show, and almost collapsed when nearly 4000 orders came in. Another shock came when Wynne took Volvo's only prototype back to Miami with him, mounted it on another 17-foot Thunderbird, and test-ran it successfully in the 1959 Miami-Nassau Ocean Powerboat



HIGH TILT to lift outdrive unit above water level is a feature of OMC line of stern-drive powerpacks

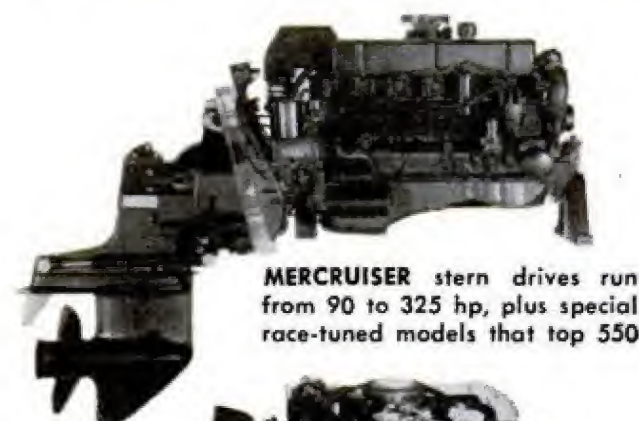
Race. His crew was Bill McKeown, now outdoor and boating editor of *Popular Mechanics*, and the two took 17 hours of open ocean in a rough passage to Nassau but finished fourth overall.

In 1960, Wynne and McKeown piloted a Hunt-designed 24-foot deep-vee hull with a pair of production Volvos in the marathon. That was the mad year when Sam Griffith and Dick Bertram won the Miami-Nassau with the famed *Moppie*, a 31-foot Hunt deep-vee. They completed the stormy crossing in eight hours. Wynne and McKeown were second, two hours later. No other boat finished until the next day. If any powerboat racing even in modern times can be tabbed as the most significant, it is that one. It established the deep-vee, developed by Ray Hunt, and the stern-drive engine, invented by Jim Wynne.

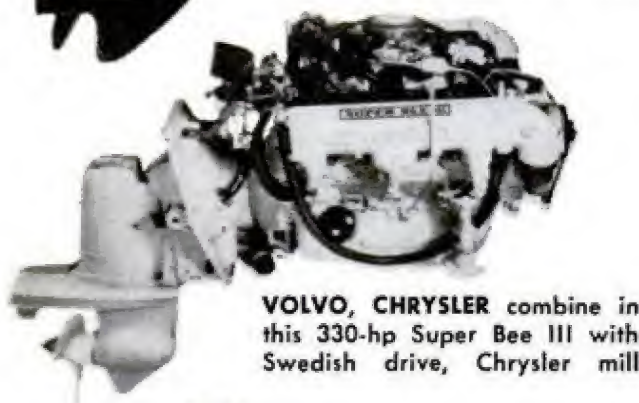
Mercury was first to follow, introducing its MerCruiser stern drive in time to win the 1962 Miami-Nassau, Outboard Marine Corp. quickly followed, as did Chrysler, and one year sales almost reached 40,000 units. Inevitably, there were some poorly engineered applications. Some boatbuilders viewed it as a universal power package for installation by unskilled labor and it went into some large hulls designed to remain permanently afloat in salt or dirty fresh water without galvanic corrosion protection.

Today the market seems to have stabilized, with well-established stern-drive manufacturers working closely with boatbuilders, and the future appears bright. Units are particularly suitable for larger trailerable craft and a host of horsepowers are available in gas or diesel models from low to over 500-hp hot racing blocks.

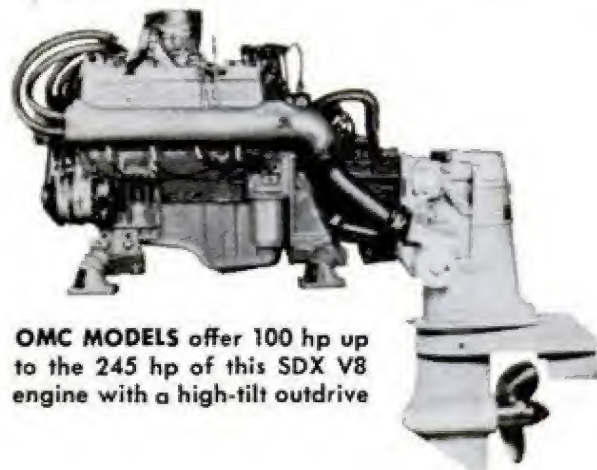
Choice can range from 90 to 325 hp for standard MerCruiser models, plus racing units of 550. Chrysler provides Volvo engines and their own, matched to Volvo outdrives, in horsepowers from 130 to 330, and Chrysler/Nissan diesels of 65 and 100 hp. Volvo diesels of 75 and 106 come from Sweden, as well as gas models at 115, 130 and 170 hp, and the Volvo outdrive is also mated to several private-brand engines. OMC stern drives from Outboard Marine come in six models of 100 to 245 hp. A boatman now has a healthy husky I/O selection from which to choose. ★★ ★



MERCUISER stern drives run from 90 to 325 hp, plus special race-tuned models that top 550



VOLVO, CHRYSLER combine in this 330-hp Super Bee III with Swedish drive, Chrysler mill



OMC MODELS offer 100 hp up to the 245 hp of this SDX V8 engine with a high-tilt outdrive

A REVOLUTIONARY WELDING TORCH!

PYRO5

\$39.95
complete

Revolutionary new concept uses solid oxygen sticks and propane to produce the 5000° plus temperatures required for welding, brazing and soldering.



Pays for itself in a hundred ways! Metal Sculpture • Model Making • Auto Repair • Plumbing • Wrought Iron • Toys
See your dealer or write factory for complete information.
Pyronetics. (A Cordon International Company)
10025 Shoemaker Ave., Santa Fe Springs, Calif. 90670.

WHITE'S ELECTRONICS INC.

THE
WORLD'S LARGEST
LINE OF MINERAL
& METAL DETECTORS

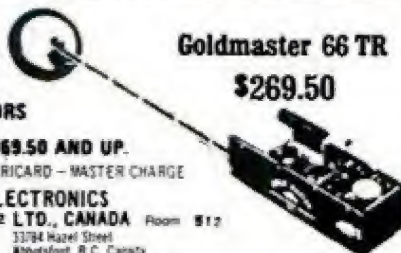
PRICES START AT \$9.50 AND UP.

BUDGET TERMS - BANK AMERICARD - MASTER CHARGE

WHITE'S ELECTRONICS
INC., U.S.A. Room 512 LTD., CANADA Room 512
1011 Pleasant Valley Road Sweet Home, Oregon 97386
33784 Hazel Street Abbotsford, B.C. Canada

THERE ARE NO FINER AT ANY PRICE.

Goldmaster 66 TR
\$269.50



SAILBOAT KITS

Free color catalog of the largest selection of popular sailboats, iceboats, and sail making supplies.

TAFT MARINE Dept. PM-8
6512 Shingle Creek Parkway
Minneapolis, Minnesota 55430

LIFTS
LIKE A HOIST
PULLS
LIKE A WINCH

1001
USES
VERTICALLY
OR
HORIZONTALLY

THERN ROPEHOIST

eliminates the snarls, rope burns and cuss words caused by make-shift block and tackle. Great for lifting, pulling, dragging, stretching or tying down just about anything. Ideal on farms, in garages or shops. Keep one in your car. A low cost, trouble free helper for every home handyman. 750 lb. capacity.

Write for Bulletin 75A

THERN, INC., Box FF347
Winona, Minn. 55987

ANNOUNCING POPULAR MECHANICS INDEX & SHELF WRAPPER

A great idea that will multiply the value of your back issues of PM. The index is bound into a handsome wrapper made of heavy board and encloses the 12 issues which are cross-referenced in the index. Makes a beautiful and useful addition to your bookshelves. Price only \$1.49. Send orders to Popular Mechanics (Dept. I) Box 1410 Radio City, New York, N.Y. 10019.

ANTI-POLLUTION AUTO ENGINES NEED SPECIAL VALVE PROTECTION

RISLONE
GIVES
IT...



Test Drive it!



FREE Get some hints from a REAL engine expert, Smokey Yunick. Send large, self-addressed, stamped envelope and we will send 32-page booklet.

THE SHALER CO.

Waupun, Wisconsin 53963
In Canada: Canadian Shaler
Products Co., Toronto 9, Ontario

USE ZIP CODE WHEN ANSWERING ADS

Print For Profit



Cards, Stationery, Envelopes, Advertising, labels, tickets, announcements, Q.S.L. cards, greeting, sympathy, prayer cards, tags, etc. Good Profits, Pays for itself in a short time.

Own a Printing Business

We supply everything direct from factory only. Easily followed rules. Also raised printing like engraving. Have home shop. Add to income. Send 25c for catalogue. **KELSEY PRESSES Meriden, Conn. 06450**

MAIL THIS COUPON TODAY!

KELSEY PRESSES, DEPT. 72-V, Meriden, Conn. 06450

I enclose 25c send big catalog and samples.

Name _____

Address _____

City _____ State _____ Zip _____



This outboard is sprightly at 50

By BILL McKEOWN, Boating Editor

Boating in the good old days was loud and slow—but also fun, we found, in our test of Johnson's anniversary antique

Photos by Jerry Imber

LIGHTER WEIGHT for easy lugging along was brag of ad for "Water Bug" of 1922



EARLIEST JOHNSON KICKER with two horses of power proved noisier than a herd of 250 hp from a pair of this year's biggest. The 1922 flyweight needed 17 pounds per hp but the new big ones shown take but two

"HAVE THE FUN without the blisters," said that first ad in *Popular Mechanics* in 1922. "Pack up your troubles, pick up your Johnson and really live!"

To test what "really living" was like afloat 50 years ago, we challenged the world's biggest outboard manufacturer to find one of those first models. How would its original compare with a 2-hp Johnson picked at random from the production run during this golden anniversary year?

In case you can't remember, outboarding must have been a ball back then, too. It was a bit different, we found, because of little problems now mostly forgotten.

Outboarding circa 1922, was a lot better than blistering your hands by rowing, but your little kicker could sometimes provide burned fingers and bruised eardrums.

Johnson set up its '22 classic for our PM vintage test at Cypress Gardens, Fla., where the latest Sea-Horse models tow showgirl water-skiers all day long. Clamped to a fishing skiff, our gleaming antique sat there like a shiny challenge to Rube Goldberg.

Early engines used to have temperamental personalities, and each owner had his own "recipe" to get his knuckle-buster started and running. "Try rocking her

(Please turn to page 180)

PUBLICATIONS **WORTH WRITING FOR**

CARRIAGE HOUSE

lawn building offers plenty of storage space and has loads of eye appeal. Basically, it's a two-story structure measuring 8 ft. wide by 12 ft. 4 in. long. In addition, there's a covered walkway that runs the length of the structure, widening the second floor by 2 ft. 4 in. The first floor is designed as a storage area for everything that ordinarily accumulates in a garage. However PM's complete plans show you how to equip it as a workshop or as an office where a man can escape. We also show how to equip the second floor as a back-yard bunkhouse that sleeps two youngsters. If you have a swimming pool, you can use the space beneath the stairs as dressing rooms. And there's even space set aside for a kennel for your dog. The plans show you the exact location of every framing member. You may need an extra set of plans for your local building department. A single set of plans (B1277) is \$3.95; two sets of plans (1277A) are \$5.49 from Popular Mechanics, Dept. CH, Box 1014, Radio City, N.Y. 10019.

REVISED EDITION of the *Popular Mechanics Catalog of Plans, Publications, Projects* is a 32-page booklet crammed full of fascinating and useful projects you can build yourself. Send 25 cents in coin to Popular Mechanics, Dept. CAT, Box 1014, Radio City, N.Y. 10019.



Treat it Rough!

Prowler is a very rare breed of cat, designed to trek where others fear to tread. Extra-strength construction where it counts . . . that's the key to Prowler's sleek-footed grace. And, inside, Prowler provides pussycat comfort, with double-barreled convenience and efficiency. You can choose from eight adventurous floor plans . . . and most of them are totally self-contained.

Still, with all of Prowler's extra value, the price tag will make your travel budget purr.

Offering honest value for the lowest possible price is a byword at Fleetwood Enterprises, Inc. That's why Fleetwood is called the "care more" company.

If your travel plans call for more than ordinary dependability, get a Prowler on your tail. You'll *never* want to let it go!

Manufacturing plants in:
Crawfordsville, Indiana
Hancock, Maryland
Longview, Texas
Pendleton, Oregon
Rialto, California



Fleetwood products —
Built in over 45 plants
nationally by people
who care.

Subsidiaries of Fleetwood Enterprises Inc.

Write for a Free Brochure:
Prowler Travel Trailers
P.O. Box 7638, Dept. PM-82
Riverside, California 92503

Name _____

Address _____

City _____

State _____ Zip _____



Let Bell & Howell Schools help you get ready for a rewarding Color TV Service Business of Your Own

Ultra-rectangular,
25" diagonal with
full 315 sq. inch
screen. Lets you
view more of the
transmitted image.
25,000 volts. 45
transistors, 55 diodes,
4 advanced IC's.
3-stage solid-state IF.
Solid-state VHF, UHF
tuners. Automatic fine
tuning and many other
quality features.



**BUILD, KEEP, USE ALL FOUR OF
THESE PRECISION QUALITY KITS**



INCLUDES—
Design Console with built-in power supply, test light and speaker. Plus patented plug-in Modular Connectors.

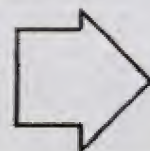


INCLUDES—
Portable 5-inch, wide-band oscilloscope calibrated for peak-to-peak voltage and time measurements.



INCLUDES—
Transistorized Meter . . . a multimeter for current, voltage and resistance measurements registered on a large, easily-read dial.

FREE! MAIL CARD TODAY FOR ALL THE FACTS
No Postage Needed



YOU'LL BE READY FOR COLOR TV . . . B&W AND MOST HOME ENTERTAINMENT ELECTRONICS DEVICES

This exciting new program offers you the *first* 315-sq. inch Solid-State Color TV available for at-home training.

As you follow the simple, step-by-step assembly procedures, you become thoroughly familiar with the most advanced solid-state TV circuitry. And as you build this kit you'll prepare yourself for a profitable Color TV service business of your own—either full or part time.

Why Color TV pays better.

Today, Color TV is the big seller. As Color Television goes completely solid-state, the man who has mastered this type of circuitry will be in demand. Obviously, this is where the money is going to be made.

This new Bell & Howell Schools program will also give you an in-depth knowledge of the basics as well as TV circuit theory and analysis. You'll get the theory and practical experience you need to handle radios, hi-fis, stereos, and tape recorders.

You will also receive three precision quality instrument kits which you assemble and keep. These are highly sensitive professional instruments which you'll use constantly.

EXCLUSIVE ELECTRO-LAB® IS YOURS TO KEEP, USE

This unique at-home laboratory comes to you in 16 shipments and includes a remarkably instructive *design console*. You can rapidly "breadboard" a great variety of circuits without soldering. The *Oscilloscope* offers 3-way jacks to handle test leads, wires, plugs. Images on screen are bright, sharp. Your *Transistorized Meter* is fully portable, features a sensitive, 4-inch, jewel-bearing d'Arsonval meter movement. It's a multimeter for current, voltage and resistance measurements.

CONSIDER THESE ADVANTAGES:

Bell & Howell Schools' Electro-Lab-at-Home Plan gives you thorough, career-oriented training in solid-state Color TV. Everything

Note: TV picture is simulated.

comes to you by mail and you go at your own speed. You'll be prepared not only for a service business of your own but for many positions in the Electronics and Television industries. All without missing a paycheck!

When you have completed your program our *Lifetime National Placement Service* will help you locate in an area that interests you. This service is available at any time—now or in the future.

Veterans' Benefits

We are approved by the state approval agency for Veterans' Benefits. If you're a Vet, check the space in the card at left for full details.

Student Financial Aid

We are an eligible institution under the Federally Insured Student Loan Program. Just check the space on the card and we'll send you full information.

Special Help Sessions

To help you over any rough spots, we've scheduled "help sessions" at the Bell & Howell Schools and in many other cities throughout the United States and Canada. Top instructors give you expert help and guidance and you meet other students, too.

When you finish your program, you may transfer to any of the Bell & Howell Schools for more advanced preparation, if you wish.

Mail the postage-free card today for all the facts. There is no cost or obligation of any kind.

DEVRY INSTITUTE OF TECHNOLOGY

ONE OF THE

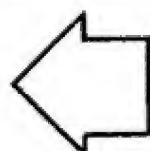


BELL & HOWELL SCHOOLS

4141 Belmont, Chicago, Illinois 60641

(TV kit is not available in Canada)

321



FREE! MAIL CARD TODAY FOR ALL THE FACTS
No Postage Needed

OCTAGONAL LAMP TABLE

(Continued from page 156)

bevel flat on the table and the point of the bevel against the saw fence. Clamp nails are designed to draw the joint together as they are hammered in. Apply glue to all joints.

Lay out the tabletop on a piece of $\frac{3}{4}$ -in. fir plywood by striking a $12\frac{1}{8}$ -in. radius and drawing an octagon. Carefully miter an edging of solid wood ($\frac{3}{4}$ x 1-in. walnut) and glue it to the plywood all around, (see drawing, page 156) flush with the top. The edging hides the plywood edges and provides solid stock for shaping.

To cover the top, cut decorative laminate in octagon shape roughly $25\frac{3}{4}$ in. across. When you cement it in place, keep it centered, $\frac{1}{4}$ in. in from the edge.

To rout the $\frac{1}{8}$ -in. decorative surface groove around the top, you'll need a jig. It's simply an octagonal ring of $\frac{3}{4}$ x 1-in. pieces made to fit the perimeter of the top. All joints of the jig are glued except one—left open ($\frac{3}{16}$ in.) so the jig can be pulled with a C-clamp to hold it in place. Here a couple of ears (wood blocks) glued to each side of the open joint will accommodate the clamp. Notice that the jig is positioned to project $\frac{1}{4}$ in. above the top to provide a lip for the router base. The groove is made with a $\frac{1}{8}$ -in. veining bit set to just barely cut into the laminate—not more than half its thickness. Distance of the groove from the edge is determined by the router's base diameter. If it's 5 in., the groove would be $2\frac{1}{2}$ in. from the edge.

Shaping the outer edge completes the top. The original was shaped with a Stanley No. 5708 cutter. In detail A the thickness of the laminate provides the $\frac{1}{16}$ -in. shoulder of the profile. Take about three passes to shape the complete profile and move the router slowly, particularly when you start cutting into the laminate, to avoid chipping. Complete the edge by careful hand sanding.

Carved panels are glued in place one at a time with contact cement. Apply the cement to the very edge of each panel, top and bottom, and decorative laminate (none along side edges of the molded panels). Also apply cement to the center panels and laminate scraps. The first panel must be positioned squarely if the final one is to align properly with the rest. It's wise to make a dry run by fastening all eight panels in place with tabs of masking

tape. Then apply guide placement strips of masking tape to the laminate along top and bottom edges to be assured of perfect alignment of all eight. These strips also serve as lines to follow when you apply cement to the laminate. If the plywood panels of the shell were cut and joined accurately, the carved panels should fit with no space showing between abutting edges. If you wish, the plywood can be stained dark along the joints before the panels are cemented in place.

The top is attached to the base with screws through four wood blocks glued to the base on the inside at the top.

We used Johns-Manville Melamite laminate to cover the table: Carpathian burl on top and ranch pecan on the sides. The eight carved panels can be purchased for \$22 postpaid from United Southern Associates, Box 5521, High Point, N.C. 26262. To get the right color, ask for panel KR-50070.

The only part that needs hand finishing is the shaped edge. After sanding it smooth, apply walnut stain and let dry. Then apply two coats of Pierce-Stevens Wood Lore or Gaston's waxing lacquer, sanding lightly between coats. Finally, apply stain only to the $\frac{1}{8}$ -in. groove in the top with a small brush. ★★

GUARD AGAINST BURNOUTS

(Continued from page 121)

leave it there during use. The Sonalert will now go on whenever voltage drops to the preset level. As soon as it does, shut off your airconditioners and other heavy-drain equipment until line voltage returns to normal as indicated by the meter. The Sonalert can be temporarily silenced by turning the TRIP control fully counterclockwise, opening switch SW1. When power returns to normal, reset the TRIP control to its original position. The Sonalert is self-powered by a 9-volt transistor-radio battery so it is independent of house current. Hold the battery in place by fastening it to the meter housing with a heavy rubber band.

Most of the components are readily available from local radio-parts stores or by mail from Lafayette Radio, 111 Jericho Turnpike, Syosset, N. Y. 11791. If you have difficulty locating the SCR and three diodes, these can be purchased for \$7.50 postpaid from Inventive Electronics, Wykagyl Station, N. Y. 10804. ★★

INSTANT 'SHAPER'

(Continued from page 142)

cutter. Normally, the fence is used with surfaces of both halves in the same plane, but they can be offset as desired—by loosening the bolts holding the junction-box halves together. The fence assembly is centered with respect to the cutter, and holes for the 1/4-in. clamping bolts are located near edges of the cabinet top. A second set of holes is drilled near the back edge of the top to provide an alternate fence position.

Make a guard ring to fit over the fence gap, which can also be used on an extension arm when nonstraight edges are being shaped. The loop, made from 1/8-in. rod, is soldered to a brass plate drilled for 6-32 mounting bolts. The extension arm, made from 1/4-in. plywood, is stepped to bring it nearer the cutter and improve rigidity. Bolts holding the guard and extension arm should be in one half of the guide fence only so you can adjust the other half for depth of cut.

Because the router switch is not easily reached when the cabinet door is closed,

Stamp out leaky windows

Lasting seals. That's what you get with DAP "33" Glazing. Use it instead of ordinary putty to replace broken glass or dried-out putty. It stays flexible for airtight, watertight seals around window glass. Lasts years longer. Takes paint.

the window fixer from

DAP

DAP Inc.,
Dayton, Ohio 45401
Subsidiary of
Pittsburgh Inc.



Stamp out messy tub joints

Easy. Just grab a tube of DAP Kwik-Seal® Tub & Tile Caulk. Squeeze a neat, white, watertight bead around tubs, sinks, showers. Stays flexible. Resists mildew. Money-back guarantee. America's favorite.

the tub fixer from

DAP

DAP Inc.,
Dayton, Ohio 45401
Subsidiary of *Pittsburgh Inc.*



you'll need an outside control. This consists of a single-pole switch and outlet (provided with ground connection) housed in a surface-mounting switch box screwed to the cabinet side. The router is plugged into the outlet.

A sizable assortment of cutters suitable for forming edge moldings, smoothing edges and other shaping chores is available. For use without a guide fence, as in cutting moldings along irregular edges, there are bits with pilots or shoulders to limit the cut. The setup illustrated had no tendency to "walk" because vibration is light. If desired, you can use C-clamps to anchor the cabinet on a table or bench.

Fingers should, of course, be kept away from cutters. Instead, various work hold-downs—such as springy steel strips—can be designed as needed, mounted on the fence and supplemented by push sticks to hold work against the cutter.

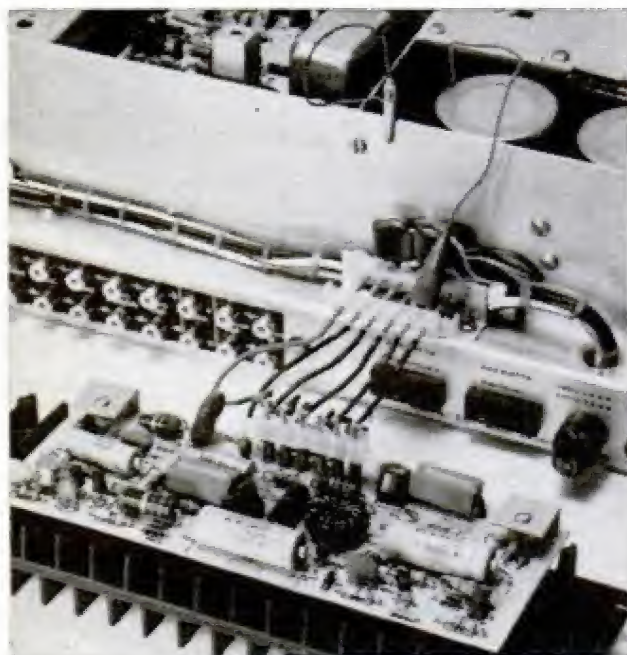
Your shaper cabinet can be finished conventionally. For the top, an easy finish is a sealer, such as thinned shellac, followed by two polish coats of floor wax. The rest of the cabinet can be varnished or painted a color. ★★★

\$700 RECEIVER IN A \$400 KIT

(Continued from page 109)

let you use the preamp and power amplifier sections separately. Each of the inputs—even the built-in tuner inputs—has its own level control, accessible through holes in the bottom plate. And even with the input sensitivity at maximum, this amplifier wouldn't overload on the output signal from my TV's audio section, as all my previous amps have. (Heath lists the input overload point as 10 volts in!) The sound is crisp, clean and quiet on all inputs: Heath lists signal-to-noise as -60 db. on FM; -63 db. on phono; and on other inputs, -75 to -90 db.

There's plenty of power, too. Continu-



EACH OUTPUT STAGE is on a separate circuit board, mounted on a common heat sink. Extender shown here allows in-circuit meter checking (note clip leads)

ous power, with both channels operating, is 60 watts per channel with an 8-ohm load, 100 watts into 4 ohms—so you get more power when driving two 8-ohm speakers per channel than when driving one. The speaker terminals take instrument-type plugs as well as bare wires.

All the basic features are there, including dual tuning meters, switchable loudness compensation and a tone-flat switch—even a button that mutes all but stereo FM stations, but I'd have gladly swapped it for high and low filters.

All told, my only gripes were the pointers on the balance, tone and volume knobs and tuning scale—they're too hard to see. Everything else is fantastic. ★★★

LEAR'S STEAM BUS

(Continued from page 118)

relatively little heat to raise it to 1100° F. at only 150 p.s.i., at which temperature it vaporizes and absorbs a large amount of heat. It is then expanded in a turbine or other engine to a pressure of 25 p.s.i. and a temperature of 60° F., at which it gives up its heat as it condenses to liquid and is pumped back into the 150-p.s.i. boiler to repeat the cycle. The theoretical efficiency of this cycle is such that, barring undesirable side effects or exorbitant cost, the discoverer of the fluid would become wealthy and famous and a new steam age would dawn. But after all these years no one has found anything that even comes close.

Steam, Wankel or gas turbine?

Is steam as much out of the running as an alternate power source as Detroit has said it was? There are obstacles and as yet unsolved problems that seem to stand in its way, to be sure, but probably not. For one thing, those long associated with the conventional engine tend to forget that emissions controls and lowered compression ratios have drastically reduced the power and fuel economy it enjoyed just a few years ago, bringing it within striking distance of naturally clean but basically less efficient alternate engines. And those automobile engineers who are grappling with future emissions standards are the first to proclaim that things will likely get worse.

Indications are that automakers are grooming the gas turbine as a replacement for the diesel in heavy-duty vehicles such as trucks and buses should emission standards, in effect, outlaw it. (Diesels tend to be heavy emitters of oxides of nitrogen, the most difficult of all pollutants to control.) If Detroit throws in the towel in trying to clean up the conventional engine, competition between powerplants for passenger cars possibly may come down to steam and the darkhorse Wankel engine. And for heavy-duty vehicles, it could be a three-way tug-of-war between those two and the gas turbine, with the lowest emitter getting the nod in both categories.

Of course, the odds against everything working out so neatly in favor of steam are large. But there's a chance, and to Bill Lear that's reason enough to forge ahead full bore. ★★★

**WELDING PERFORMANCE YOU CAN'T BEAT
AT A PRICE THAT
CAN'T BE MATCHED.**

Only **\$18.95**

for this heavy-duty welder
from Four-Way.

We've sold hundreds of thousands over the last 35 years. This rugged complete Four-Way Welder operates on 110V 30A for pennies. Yet it can weld, cut, braze or solder just about anything made of metal. It comes complete in a heavy-duty cabinet with heavy-duty cables and ground clamp, full face helmet, adjustable torch and rod holder and two big bonus packs of instant arc welding rods, brazing rods, 1/4" carbons, solder and flux. Also included is a complete, simplified welding manual. Use it free for ten days and get your money back if not satisfied. Just send \$2.00 and then pay \$16.95 C.O.D. and delivery charges. Or send \$18.95 prepaid. Shipment in Continental U.S.A. Illinois residents add 5% sales tax. **FOUR-WAY WELDER COMPANY, 1810 Federal Street Dept. PM82, Chicago, Illinois 60616**



FIND BURIED TREASURE

Powerful electronic detector finds buried gold, silver, coins, etc. 5 new models. Write for free catalog.



RELCO, Dept. D-3

19.95

BOX 10839, HOUSTON, TEX. 77018

HEADQUARTERS
FOR EVERY
TYPE & SIZE
AT REAL
DOWN-TO-
EARTH MONEY
SAVING PRICES!



ALL FAMOUS BRANDS!
TIRES!
AUTO TRUCK
SPORT CAR
FARM
TRAILER
TREMENDOUS SAVINGS!
LET US PROVE IT TO YOU!
...WRITE US TODAY...

Send for your FREE catalog!

RELIABLE TIRE CO. 1111 Chestnut St. Camden, N.J. 08103

TWO-IN-ONE ELECTRONIC MARVEL PHONE MONITOR & TELEPHONE AMPLIFIER

Can Be Used With Phone
on Or Off Hook

This minute-size device used as a phone monitor attaches easily (no installation necessary) to the side of your extension phone and picks up conversations going through the main wire even without lifting the phone off the hook. As a phone amplifier with receiver off hook you can have a hands free conversation without being chained to your phone. This electronic wonder also enables you to listen in on hush-hush conversation your teenager has. At the office, secretaries need to listen in without disturbing the conversation with typewriter noises, etc. Also a wonderful second receiver when more than one party wants to hear the conversation. Has volume control, operates on standard mercury battery (included). Complete with ear plug. Only \$12.95 plus 50c pp. Save \$2.00—two for \$24.95 ppd.



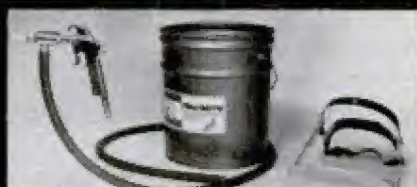
Send Check or M.O. Satisfaction Guaranteed.
J. W. HOLST, INC. Dept. PM-8, 1005 E. Bay St. East Tawas, Mich. 48730

Sandblaster Kit

**Removes paint and rust—
Dozens of home uses!**

Ideal for preparing surfaces for painting, cleaning rust from tools and other items! Rugged P&G unit features trigger control with comfortable hand grip. Kit includes 5-gallon hopper, Mark II quality sandblast gun, 2 ceramic nozzles, 7 feet of sandblast hose, 1 pickup tube and a safety eye shield. Your money back if not satisfied!

\$44.95



Check enclosed for _____ P&G Sandblaster(s)
\$44.95 plus 5% tax for California residents.

Name _____ Age _____
Address _____ City _____
State _____ Zip _____

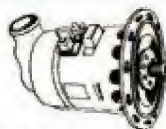


PAULI & GRIFFIN CO.

285 Lawrence Avenue
South San Francisco, Calif. 94080

USE THIS AD TO ORDER

GOVT. SURPLUS AND OTHER BARGAINS SAVE UP TO 90%



400 AMP JET GENERATOR

Exc. for use as arc welder. Rated 400 amps @ 3000 RPM @ 30 VDC. Produces up to 600 amps intermittently. Has 1 1/4"-24 tooth splined drive shaft. Mounting flange 11" dia. with 10 bolt mounting holes. 15" L x 8" dia. Turns C.C.W. facing drive shaft end. Mfg. by Jack & Heintz. GOVT. COST \$353. Like NEW. Shpg. wt. 90 lbs. \$54.50. (Stk. #2637)



HYDRAULIC CYLINDER 32 1/2" stroke, 2" bore, 1" shaft. Operating pressure 3000 P.S.I. Top and bottom of cylinder contain 1/4" ID mounting hole with self-aligning bearings. Closed 43". Inlet and outlet ports 9/16" - 18 (26). Will produce 9000 lbs. thrust. GOVT. COST \$269.60. Govt. overhaul cond. Shpg. wt. 16 lbs. (Stk. #2932) **\$32.50.**



DUAL DRIVE GEAR MOTOR

Heavy duty. Rated 5 HP @ 26 V.D.C. @ 270 RPM under load. Turns 125 RPM @ 12 V.D.C. Top shaft turns @ twice straight shaft speed. Shaft dia. 5/8". Gear reduction 33 to 1. Reversible. 18" L x 5" dia. Exc. for winches, capstans or small elect. car motors. Shpg. wt. 39 lbs. GOVT. COST \$580. Like NEW, **\$34.50.** (Stk. #2398)



NEW! BIG 1972 CATALOG

Send 35c (\$1 for airmail). Catalog contains 1000's of bargains in hydraulics, electrical, marine, automotive items, etc. 90 day guarantee. ORDER FROM AD. Prices FOB Culver City, 50% dep. for COD. Cal. res. add 5% sales tax. Must incl. zip code. Satisfying customers world-wide since 1945.

AIRBORNE SALES CO.

Dept. **PM872**

8501 Steller Dr. • P.O. Box 2727 • Culver City, Ca. 90230



You can make money in

WATCH REPAIR

Learn at home the low cost Sweazey Way

Develop your skill step by step in your spare time at home. Chicago School of Watchmaking's exclusive Sweazey System shows you how to repair all types of Swiss and American watches. Practical shop training. No previous experience needed. Age no barrier. Diploma awarded. Send today for free information and sample lesson. No obligation. No salesman will call.

CHICAGO SCHOOL OF WATCHMAKING

Dept. 182 Fox River Grove, Illinois 60021

FREE BOOK and SAMPLE LESSON

CHICAGO SCHOOL OF WATCHMAKING

Dept. 182, Fox River Grove, Illinois 60021

Please rush FREE BOOK and Sample Home Study Lesson.

Name _____ Age _____
Address _____ City _____
City _____ State _____ Zip _____

State _____ Zip _____

State _____ Zip _____

State _____ Zip _____

ELECTRONIC 'EYES'

(Continued from page 90)

several inches away from the transmitter. The system works by triangulation. The angle between the transmitted beam and reflected light determines the obstacle's distance—the wider the angle, the closer the object.

Until recently, laser detectors have been confined to the so-called "seeing-eye canes" made for the Veterans Administration by Bionic Instruments, Inc., of Pennsylvania. To provide sufficient vertical coverage, the canes incorporate three laser beams—one pointed down, one ahead and one up. Together they provide a means of establishing the height of an obstacle as well as its distance. The rub is the cost—more than \$4000 per cane.

Laser device in eyeglasses

Now, however, the same company is working on a smaller, more compact laser device that, like Mims's, is built into a pair of eyeglasses. While details are not yet known, it may well be considerably cheaper since it presumably would not require three separate laser beams as the canes do.

Another approach, still in the laboratory stage but offering promise, is the ingenious TV system being developed at the Smith-Kettlewell Institute in San Francisco (see *The blind "see" with TV*, page 82, Jan. '72 PM). In this system, a small TV camera worn on the user's head becomes his "eyes." Signals from the camera are translated into thousands of tiny tingling electrical pulses that stimulate the nerve receptors in a patch of skin in the same way that light rays stimulate receptors in the retina of the normal eye. The electrical sensations are transmitted through the nervous system from the skin to the brain where they form a mental image corresponding to the scene viewed by the TV camera. These images are admittedly crude and shadowy, but they help to give the user an idea of what's ahead. With improvements in the system's sensitivity, it's possible that electronic eyes may someday become literally a reality—perhaps even small enough to fit into the space of an artificial glass eye.

In cases where corneal transplants have failed or can't be performed, a British surgeon, Dr. D.P. Choyce, has come

up with a clever means of inserting a plastic lens in the eye in much the same way as a camera lens is screwed in place. A threaded plastic socket is first implanted in the eye, forming a flange. When eye tissue has securely grown around the implant, a threaded barrel-shaped plastic lens is screwed into the socket, completing the operation and restoring sight.

Blind helped to read faster

Not all of today's research for the blind is aimed at navigational aids. Two spectacular recent developments enable the sightless to read faster and more easily than ever before. One is a small portable device about the size of a shoulder-strap tape recorder with a tiny hand-held photoelectric sensor on the end of a cord. The user simply runs the sensor along a line of printed type. Optical images formed by the photoelectric sensor are translated into corresponding shapes in rows of tiny vibrating pins. If the letter scanned is an A, the pins vibrate in the shape of an A. The user keeps a finger pressed lightly against the pins and thus can feel the changing shapes of letters as the sensor is moved along a line of type.

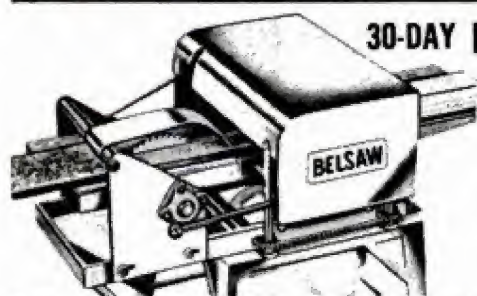
Called the Optacon, the device is being developed at Stanford University in California. It not only eliminates the need to translate books and other printed matter into braille—an expensive and limited proposition—but it increases reading speed, too. With practice, users eventually exceed the 150-word-per-minute rate generally considered maximum for braille. Being portable, the device can be used anywhere—even to read a menu in a restaurant or a magazine on a train. Biggest drawback at the moment is its cost—\$5000 each for handmade prototypes.

A similar aid, called the Optophone and developed in England, is under study here by the Veterans Administration. It uses a moving beam of light to scan printed words and translate them into coded musical tones, somewhat like Morse code. A user listens to the tones and deciphers their meaning in much the same way as a code operator. Unlike the Optacon, however, it is not designed for portable use.

Whatever the system, the marvel of electronics is bringing the sightless closer to seeing every day—a miracle thought beyond the scope of human achievement only a few short years ago. ★★★

BELSAW PLANER • MOLDER • SAW

30-DAY FREE Trial!



Now you can use this ONE power-feed shop to turn rough lumber into moldings, trim, flooring, furniture...ALL popular patterns. RIP...PLANE...MOLD—separately or all at once with a single motor. Free 30-Day Trial. Low Cost—only \$35 down.

Send Postcard Today — No Salesman Will Call.
BELSAW POWER TOOLS, 903P, Field Bldg., Kansas City, Mo. 64111

EVERYONE'S
RACING
TO GET UP TO

\$1870

WIN
a race
day
with
\$20
STKS.

DON'T YOU be left behind—don't YOU miss out. If only you knew how wonderful PENCLIFF the world famed race computer really is with wonderful wins on the day up to \$1870 with just \$20 stakes, YOU would ask us to RUSH full details TODAY.

FOR FABULOUS WINS SIMPLY feed into PENCLIFF race computer details from race programs. Get FACTS—over 4,000 BIG PENCLIFF WINS incl. with \$20 stakes on all PENCLIFF picks. PROFITS ON THE DAY of \$1150, \$1180, \$1210, \$1340, \$1410, \$1510, \$1870, etc., (up to \$187 profit a day with \$2 stakes). Learn how an accident on the inventor's yacht, 25 yrs. Racing 'know-how', aid of 12 other experts and a giant I.B.M. computer, all led to the invention of AMAZING PENCLIFF. R.H.P. Co. Box 5715-PME 29 Carmel, Calif. 93921. (Tear out this ad NOW—mail with name, address, zip, for FULL EXCITING details)

LEARN UPHOLSTERY AT HOME!

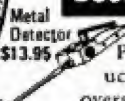


Men & Women All Ages! Send for free book on learning to reupholster chairs, divans, footstools, all furniture for BIG MONEY in spare or full time. No experience needed, no age or educational limits. We show you how and provide EVERYTHING needed to start: (1) Home training covering all phases, (2) all tools and 6 big furniture kits for practice, (3) free supplies, frames & materials to build \$300 worth of furniture, yours to keep or sell. Write TODAY for big free upholstery career book. No obligation, no salesman will call. Veteran Approved. Modern Upholstery Institute Box 899-FPP, Orange, Calif. 92669.

Calendar Watch \$4.45



Field Glasses \$5.24



Metal Detector \$13.95

Men-Women, new Drop Ship Plan. Fast profits without product investment! Deal direct with overseas sources. Buy small quantities. Prices include duty & postage. Full or spare time. Write for FREE PLAN, state age.

MELLINGER, Dept. F2258, 6100 Varrel, Woodland Hills, CA 91364

"LISTEN IN" TO POLICE-FIRE RADIO CALLS IN YOUR CAR!

WORKS with ANY CAR—Portable or HOME RADIO! Just PLUGS in—No wiring—3 minute hookup! Switch instantly from regular to ALL POLICE-FIRE-EMERGENCY-COMMERCIAL-TAXICAB-STATE-CITY-GOV'T 2 way Radio calls in YOUR AREA. DUAL-HI-LOW BANDS—OVER a MILLION Radio Cars/stations. USE Everywhere—anytime—always works.

SEND ONLY \$2.00 (cash, Ck., M.O.) and pay post. man \$7.99 plus COD pkg or send \$0.90 for ppd Del in USA. COMPLETE, ready to use with instructions. One Year service Warranty—10 DAY MONEY BACK TRIAL (if retnd). Limited offer includes "Plug in" for ALL RADIOS

WESTERN RADIO Dept. BPM-8 KEARNEY, NEBR. 68847



Be a VETERINARY ASSISTANT

...Lab Technician, Zoo Keeper, Pet Shop/Kennel Owner

MEN - WOMEN! Train at Home in Spare Time...

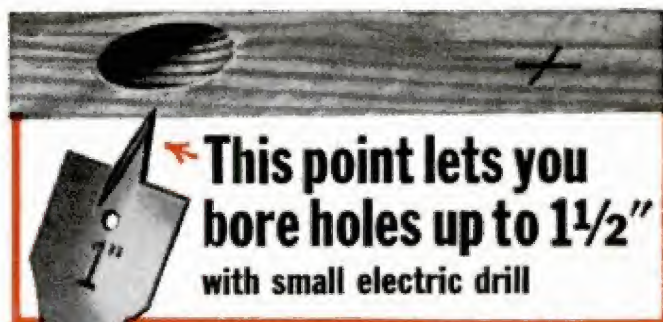
Send for Career Kit—ALL FREE!

Name _____ Age _____

Address _____

City _____ State _____ Zip _____

North American School of Animal Sciences, Dept. 24178
4500 Campus Dr., Newport Beach, CA 92663



This point lets you
bore holes up to 1 1/2"
with small electric drill

IT'S HOLLOW GROUND to bore
cleaner, faster at any angle

Now step-up the boring range of your small electric drill or drill press to 1 1/2" with Irwin Speedbor "88" wood bits. 1/4" shank chucks perfectly. No wobble. No run-out. Sharp cutting edges on exclusive hollow ground point start holes faster, let spade type cutters bore up to 5 times faster. You get clean, accurate holes in any wood at any cutting angle.

Each Irwin Speedbor "88" forged from single bar of finest tool steel. Each machine-sharpened and heat tempered full length for long life. 17 sizes, 1/4" to 1 1/2", and sets. See your Irwin hardware or building supply dealer soon.

\$.98 each \$ 1.10 each \$ 1.15 each \$ 1.70 each
1/4" to 3/4" 5/8" to 7/8" 1 1/4" to 1" 1 1/8" to 1 1/2"

IRWIN SPEEDBOR "88"
WOOD BITS

at Wilmington, Ohio 45177, since 1885

MAKE BIG MONEY OPERATING HEAVY EQUIPMENT



BULLDOZERS
CLAMSHELLS
TRENCHERS
DRAGLINES
BACKHOES
SCRAPERS
GRADERS
CRANES

The Construction Industry is Booming! Earn top money in this fast moving, action-packed field. Keep present job and train at home in spare time followed by practical training on our machines under project conditions at our facilities. Nationwide placement assistance. For FREE information fill out and mail coupon today!

Member American Road Builders' Assn.

APPROVED FOR VETERANS AND INSERVICE PERSONNEL

UNIVERSAL HEAVY CONSTRUCTION SCHOOLS, Dept. PM

1901 N.W. 7 STREET / MIAMI, FLORIDA 33125

Phone: (305) 642-0800 (24 Hours)

Please Print

Name _____ Age _____

Address _____

City _____ State _____

Phone _____ Zip _____



NEWEST two-horse Sea-Horse is 11 pounds less than first model, pivots to reverse, has innards enclosed



BLAZING ALONG at about a big two knots, oldster banged out the sound of speed, reversed by pivoting



INSTANT START, automatic starter rewind, safety cowling, nontemperamental run now taken for granted

OUTBOARD SPRIGHTLY AT 50

(Continued from page 168)

first against the compression," suggested photographer Jerry Imber as we wound up the old familiar length of clothesline around the old familiar flywheel to rope her through a few times first for pictures before settling down to the starting battle. (Remember the early morning scene of a fisherman far out on the quiet lake as he pulled and pulled on the starter cord while soft profanity floated in over the water?)

Jerry had had one of the first Johnsons when he was a youngster, back when our antique was considered just an outmoded old clunker for a kid rather than for a museum. He had run his on a boyhood camping trip down the winding Suwanee River. "Pull the rope part way several times to let the flywheel bounce against the compression so gas can prime in through those big old ports," was Jerry's starting recipe.

We set the spark to start, pulled the cord partway to rock the flywheel and then roped her through. Bang, and she was firing like mini-firecrackers with the skiff tugging at the mooring lines before Jerry could get a picture. And so we cast off, holding onto our borrowed straw skimmer as we blazed along at an estimated two knots. Just as well we hadn't lined up a banjo for this 1920s boating scene. How could that pretty girl up in the bow ever hear it?

A neat little water pump for engine-cooling water was on the lower unit, we noted. Motor speed was controlled by setting the spark rather than a throttle. Turning the engine full pivot for reverse, you got a reminder to hold the gas tank rather than cylinder heads as you burned a hand. Though we didn't have them, accessories in the catalog included a stern bracket to bolt on a canoe, or an inboard/outboard mount so the lower unit could be bolted up through a hole in the keel.

No wonder the motor was the lightest of its day. Previously the Johnson brothers had built what were probably the world's first metal and single-winged airplanes.

But Johnson's 1972 2-hp, smallest of its 26-model line, weighs 11 pounds less than the first, started each time at first pull, is smaller, quieter and costs only \$40 more. No recipe for running is needed; you can even bring your banjo. ★★★



TAKE OFF...STRAIGHT UP in a Scorpion Too

Have you heard about sport flying?
Did you know that you can participate
in your own personal helicopter

The Scorpion Too is RotorWay's
answer to backyard flight.

**Remember, the Scorpion is a
true vertical take-off helicopter,
it takes off straight up.**

Using a 140 h.p. engine, it cruises
at 75 m.p.h. and can carry over
400 lbs. The most exciting news
about the twin-seat Scorpion
is its low cost, but then it's about
time a helicopter became a
recreational vehicle.

The twin-seat Scorpion is designed to be
built and flown for the same price as its
successful single-seat predecessor.

Find out about the complete RotorWay story
... a truly exciting adventure in vertical flight.



Send \$5 for the full color
introductory package and special offer.

ROTORWAY, INC.

Dept. B6/14805 S. Interstate 10
Tempe, Arizona 85281

Name _____
Address _____
City _____ State _____ Zip _____

Two or
four-wheel drive
**JEEP or
SCOUT**
owners

REPOWER with a 6 or V-8.
H.D. ADAPTORS for using Car,
Compact and some Truck engines.
"State year & model, Jeep or
Scout." Want fast action? Give us
FULL INFORMATION. Send \$25.00
Dep. and we will ship correct kit,
bal. COD. Send full amount for
prepaid shipment. Wire, phone or
write today. Details **FREE**

HOOSIER MACHINE PRODUCTS CO.

312 S. E. 6th St., Phone 276-3442. Pendleton, Oregon 97801



POWER HACKSAW KIT ONLY \$24.95

Also 51 other money-saving projects
to be built in the home workshop.
Lathes, drill presses, vises, etc. Send
50¢ for 28 pg. Catalog.

C.F. STRUCK CORP. Dept. PM-82, Cedarburg, Wis. 53012

POPULAR MECHANICS PM-BEE! Plan for a radio-controlled model that flies on CO₂. Fuel is nonflammable and odorless. Sophisticated and simple to build! To obtain full-scale pattern from which you can trace off the parts directly, send \$3.49 to **POPULAR MECHANICS** Dept. FA, Box 1014 Radio City, New York, N.Y. 10019.

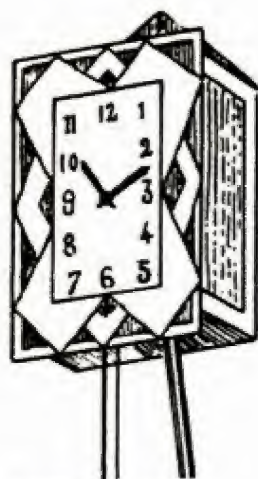
Does More Than Help Shrink Swelling Of Hemorrhoidal Tissues Due To Infection

**Also gives Prompt, Temporary Relief in Many
Cases from Pain, Itching in Such Tissues.**

Doctors have found a remarkably successful medication that actually helps shrink swelling of hemorrhoidal tissues when infected and inflamed. And it *does more*. In many cases it gives relief for hours from pain and itching in

these tissues. Tests by doctors proved this true in many cases.

The medication used in these tests was Preparation H. And no prescription is needed for Preparation H®. Ointment or suppositories.



PAPER CLOCK

For fun, build this Paper Clock and enjoy a great horological experience. Easy-to-follow diagrams with instructions in French. Just to keep you on your toes! The techniques of building a rigid frame and gears of cardboard are truly fascinating. Use of a steel ruler and razor are needed since parts are not pre-cut. 10 1/4" high and 7" wide when finished.

**CLOCKS
YOU
BUILD
FROM
Caldwell
Industries
LULING
TEXAS**



13th Century Clock

A clock that adds a touch of yesteryear by keeping time with one hand! Magnificent engineering of balanced counterweights control the ticking that adds authentic charm to this timepiece. Verge & foliot movement with exposed gears. Classic Roman numerals on a 7" face. All beautifully finished with rosewood tone. The plastic kit easily snaps together without glue or nails. 18" high with 36 parts, but only one hand!



HUNDREDS OF PROJECTS in the CRAFTSMANSHIP CATALOG. Shows machine tools, tool kits, steam engines, locomotives and clocks you can build. All for just \$2.

**CALDWELL INDUSTRIES
BOX 170, LULING, TEXAS 78648**

1972 CRAFTSMANSHIP CATALOG	<input type="checkbox"/>	\$2.00
13th Century Clock	<input type="checkbox"/>	5.50
Cardboard Clock	<input type="checkbox"/>	4.25
Teach Yourself Horology	<input type="checkbox"/>	4.00
Practical Watch Repairing	<input type="checkbox"/>	8.00
Practical Clock Repairing	<input type="checkbox"/>	7.50
Model Stationary & Marine Steam Engines	<input type="checkbox"/>	4.50

SATISFACTION GUARANTEED ALWAYS

NAME _____

ADDRESS _____

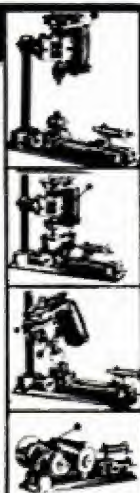
5-in-1 METAL LATHE

UNIMAT



Easy for modelmakers, gunsmiths, inventors to precision machine small parts. Lathe converts in seconds to vertical mill, drill press, grinder & polisher. AC/DC motor, 11 speeds, 3" swing, 17" overall. 90,000 in use. \$169.50. Send for free details, or \$1 for 48-page "Miniature Machining Techniques" handbook. (Available in Canada.)

**AMERICAN EDELSTAAL, INC. DEPT BH-2
1 ATWOOD AVE., TENAFLY, N.J. 07670**



BUILD THESE BEAUTIFUL CLOCKS

NOW AT BIG SAVINGS!

Send just \$1 for plans & instructions to build choice of: (A) Grandfather, (B) Steeple, (C) Grandmother—plus information-packed catalog of movements, dials, parts & kits to build these & 16 other fine clocks. All 3 plans—\$2.50. Catalog alone—25¢.

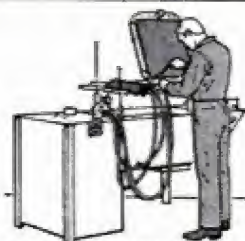
**MASON & SULLIVAN COMPANY
Dept. PM, Osterville, Mass. 02655**



**MAKE \$20,000 TO
\$30,000 A YEAR!**

Combination AUTO RADIATOR REPAIR/ AIR CONDITIONING SHOP!

(part, full-time, or
add to your shop)



**NEW!
C-600
Radiator
Shop
takes
only
3 1/2 x 6'
space**

Now is the time to get in on the ground floor with two of the newest and most profitable auto services. There are not enough trained and equipped people to do the work. Invest little as \$2,000. Inland factory training makes you an Auto Temperature Control Specialist! Complete package includes all equipment, training & business management, easy-learn manuals...works just like a franchise, except you are the boss. Immediate profits, year-around work. Write for free catalog. Inland Mfg. Co., Dept. PM-8, 1108 Jackson St., Omaha, Nebr. 68102.

PUMP DRAINS pools, cellars, laundry tubs IRRIGATES — CIRCULATES — SPRAYS



Heavy duty ball bearing pump. All metal, rust-proof Type XB. Stainless shaft. Use 1/4 HP or larger. 1 HP 1,200 GPH 60" high or 3,000 GPH 25" well. 5,200 GPH max. 1 1/4" in; 1" out. Belt or direct drive. \$13.95 Type P won't rust or clog. Bronze bearing. To 2,400 GPH. 1" in; 3/4" out. \$9.95 P'd cash with order. Money back Guarantee.

LABAWCO, Box 40, Belle Mead, N.J. 08502



MINI-BIKE PARTS

Wholesale Prices

"Build your own" kits...Big savings...Repair parts...Welded frames & forks, enameled...Chains...Clutches...Brakes & throttle controls...Wheels...Tires...Bearings...Axles...Engines...etc. Send 50¢ for illustrations and lists...SAVE DOLLARS!

BYCO, Dept. B, Box 6241, Omaha, Nebr. 68106

BASEMENT TOILET FLUSHES UP



TO OVERHEAD SEWER OR SEPTIC TANK. NO DIGGING UP FLOORS. INSTALLS EASY. Write **McPHERSON, INC., BOX 15133, TAMPA, FLORIDA 33614**

PROFIT IN YOUR SPARE TIME SMALL ENGINE REPAIR PAYS BIG!



Outboard • Powermower • Chain Saw • Tractor
MAKE EXTRA MONEY — or fix your own engines and SAVE! Illustrated, easy-to-learn Home Study Course trains you expertly. Approved for Veterans. Write today!

**LINCOLN TECHNICAL INSTITUTE
SUITE 8E, 2299 VAUXHALL RD., UNION, N.J. 07083**

New Gas Engine Sale

Briggs & Stratton, Lauson, Wisconsin, Kohler, etc. as low as \$29.50. New surplus. Send 25¢ for 100 page catalog listing 100's of items.

MASTER MECHANIC MFG. CO., Dept. A-82 Burlington, Wis.



LEARN MEAT CUTTING

Train quickly in 8 short weeks at Toledo for a bright future with security in vital meat business. Big pay, full-time jobs — HAVE A PROFITABLE MARKET OF YOUR OWN! Time payment plan available. Diploma given. Job help. Thousands of successful graduates. OUR 40th YEAR! Send now for big new illustrated FREE

catalog. No obligation. G.I. Approved. NATIONAL SCHOOL OF MEAT CUTTING Dept. 50M, Toledo, Ohio 43604

EARN MONEY FAST!

REPAIR HYDRAULIC JACKS

Earn while you learn at home. Millions of jacks in gas and auto service stations, trucking firms, body shops, riggers, factories and farms need servicing... most of which you can learn to repair. We show you HOW. Start spare time in your basement or garage. Big opportunity for mechanics. ACT NOW!

Write for folder PM-8 and free bonus offer



HYDRAULIC JACK REPAIR MANUAL CO., INC. G. P. O. BOX 3 • STATEN ISLAND, N. Y. 10314

THE AUTO ELECTRIC

Power-For-Tools. 110 V.D.C. Electricity from a car's alternator. Installs on—Most late model cars, trucks or tractors. Will operate power tools, light bulbs, heating devices, etc. Operates any brush-type 110 V. A.C.-D.C. electric motor. Battery charging. Easily installed.



Checks or Money Order:

\$16.95 Without 150 V. D.C. Meter
\$19.95 With 150 V. D.C. Meter

Plus Postage \$1.25 & Texas Sales Tax ONLY

Auto Air Equipment Inc., P.O. Box 2886PM, Amarillo, Texas 79105

This easy-to-build model flies on CO₂

Whether you are a typical model builder or an ace at the local model-plane meets, here is an unusual little plane to add to your squadron. It's sophisticated but fairly easy to build and is powered by a simple, smokeless, almost silent CO₂ engine.

The PM-Bee can be built as a free-flight or radio-controlled flier. Full-scale patterns are available. Just fill out the coupon below.



To: Popular Mechanics
Box 1014 Dept. BEE
Radio City
New York, New York 10019

Please send me complete plans and patterns for building the PM Bee. Enclosed is payment of \$3.49.

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

APPROVED FOR VETERANS

These 3 BIG DRAFTING KITS GIVEN TO YOU!

... when you train at home with NASD for a

HIGH PAY JOB IN DRAFTING!

Take your pick of 1000s big salary jobs open to Draftsmen. U. S. Labor Dept. reports "42% more Draftsmen needed in next 10 years—not enough applicants to fill jobs available now." Easy home-study plan has helped 100s beginners toward \$\$\$\$\$, security, prestige as Draftsmen—many with only grade school training. Others report good earnings drafting part time while still learning. Why not you?

RUSH COUPON FOR FREE KIT!

Mail coupon for FREE "DRAFTING CAREER KIT," Sample Lesson, Drafting Aptitude Test including new 5-Way Drafting Instrument & 20-Page Book, "Your Future in Drafting"—ALL FREE.

G.I. approved. Write today

NORTH AMERICAN SCHOOL OF DRAFTING, Dept. 24178
4500 Campus Drive, Newport, California 92660

Rush "Drafting Career Kit," including Book, Sample Lesson, Aptitude Test & Drafting Instrument—All Free!

NAME _____ AGE _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____

**Makes Over \$60 EXTRA a Week
In Own Sharpening Shop!**

"My Belsaw Sharp-All made me \$3,500 last year just in spare time. Now I'm going full time. It's great to be your own boss."

David Swanson — Utica, Michigan



**Let Me Prove
YOU
Can Do It Too!
on our
30-DAY
FREE TRIAL**

You risk nothing by accepting this offer to see how easily you can turn your spare time into Big Cash Profits with your own Complete Sharpening Shop. No selling . . . No previous experience needed. Our famous Sharp-All and show-how instruction set you up to make \$200, \$500, \$700 a month CASH sharpening SAWS, KNIVES, SCISSORS, LAWNMOWERS, Shop and Garden tools . . . all cutting edges.

Send coupon for FREE facts on this money-making business. We'll even finance you.

RUSH COUPON TODAY!

BELSAW SHARP-ALL CO.
713P Field Bldg. Kansas City, Mo. 64111

No Obligation — No Salesman Will Call

BELSAW SHARP-ALL CO. 713P Field Bldg., Kansas City, Mo. 64111
Send details of FREE TRIAL OFFER and Free Book "Lifetime Security". No obligation.

Name _____
Address _____
City _____ State _____ Zip _____

CHOOSING AND USING THE RIGHT PAINT booklet.
Everything you should know about house paints.
Price 50¢. Send to: **POPULAR MECHANICS Dept. FA,**
224 W. 57th St. New York, N.Y. 10019.

1¢ SALE
GUARANTEED
10 YEARS



The knife for hunting, fishing and all around use. Mirror polished, imported stainless steel blade honed to a razor's edge. Rugged. Opens quickly, easily. Locks into position. Blade will not close when in use. Press button in handle to close. Safety finger guard. Sure-grip handle. Balanced for target throwing. **IF BROKEN WITHIN 10 YEARS WE WILL REPLACE AT NO CHARGE!** Use 30 days. Money back if not pleased. Special 1¢ sale. REG. PRICE \$1.98. Send \$1.99 & receive 2 knives. Add 49¢ postage, handling. Remit **TOTAL \$2.48** for 2 knives. **ORDER NOW!** Midwest Knife Co., 9043 S. Western Ave., Dept. DD-5708, Chicago, Ill. 60626, Est. 1936.

ELECTRIC ARC WELDER \$9.99!



HEAVY DUTY Design—No experience needed—FREE WELDING LESSONS!
SEND ONLY \$2.00 (cash, ck, M.O.) and pay postman \$7.95 C.O.D. paid del. in U.S.A.: **COMPLETE READY TO USE—Includes BIG pack steel, Brazing, Solder, Carbon "touch" rods. ELECTROFLAME ARC TORCH! OFFER LIMITED—Order TODAY!**
MIDWAY WELDER Dept. EPM-8 Kearney, Nebr. 68847

NATIONALLY ADVERTISED \$18.95 VALUE!—NOW 1/2 PRICE!
WELDS—BRAZES—SOLDERS—CUTS—ALL METALS! Plugs into ANY 110 volt socket. MAKE—REPAIR 1001 items for CAR—HOME—BUSINESS. Lifetime BURNOUT GUARANTEE 10 day money back trial (if retrnd).

NEW 80 AMP DYNAMIC MARK 88 INDUSTRIAL TRANSFORMER ARC WELDER

IDEAL GIFT—EDUCATIONAL, ENJOYABLE, PROFITABLE

WELD, BRAZE, CUT, SOLDER, HEAT STEEL, BRASS, ALUMINUM, AND MOST OTHER METALS.



Build and repair anything of metal. Save time & money with this **BRAND NEW, PROFESSIONAL ARC WELDER!** Rugged metal cabinet, baked Hammerloid finish. Ideal for home, shop, farm and industrial use. **POWERFUL** glass insulated transformer welds most metals up to 1/2" thickness with multi-pass weld, with 1/4" rods. 4 heat settings 20 to 80 amps. Operates on 110 Volt AC line fused for 30 amps. Complete with fibre glass helmet, electrode holder, ground clamp and cables, solder, assorted rods and simplified welding manual. **DOUBLE PROTECTION GUARANTEE.** 10 day money back trial plus full 5-yr. warranty. If inoperative return prepaid, we will repair or replace without charge & reship collect. **ORDER TODAY. Complete ready to weld. Only \$39.50 F.O.B.**

SEND ONLY \$6.00. Pay Balance plus C.O.D. and Delivery Charges
FREE Write for illustrated color literature and welder details

DYNAMIC WELDER CO. 1808 S. FEDERAL ST. Dept. PM82 CHICAGO, ILL. 60616

INVENTORS

INVENTIONS—NEW PRODUCTS—IDEAS DEVELOPED & PREPARED

For Commercial appeal & sales

DESIGN—MARKETING—PATENT RESEARCH—DRAWINGS

Second Decade of Reliable Service To

INVENTORS—MANUFACTURERS—ATTORNEYS

Director: United States Patent Office Former Examiner

United States Dept. of Army Former Patent Adviser

Member: United States Council Int'l Chamber of Commerce

FREE CONSULTATION

THE RAYMOND LEE ORGANIZATION

230-Z Park Ave., New York 10017 (212) MU 6-8500

SEND FREE "Invention Record" Form & "Product Marketing" Brochure

Name _____
Address _____
City _____ State _____ Zip _____

MAN'S WIG \$9.95
no need to pay \$50

Stretch Wig Completely Covers All Your Hair and Sideburns

Stays in place on all size heads—easy to put on. Thinned and razor cut—handsome tapered look and full sideburns. Cool and lightweight. Made of modacrylic fiber—looks and feels like real hair—has luster, rich body and bounce of human hair. Can be washed and shampooed—never loses its shape—can be combed, trimmed and restyled if you wish. Specify color desired: Black, Off Black, Chestnut, Dark, Medium or Light Brown, Dark Blonde, Grey and Black mixed, Grey and Brown mixed. Mention Style M-105. Send \$2 deposit and pay postman on delivery balance plus C.O.D. postage. Or send only \$9.95 and we will pay postage. Money back guarantee if not satisfied.



FRANKLIN FASHIONS Dept. M-184
378 S. Franklin St., Hempstead, N.Y. 11550

POPULAR MECHANICS

The bargain hunter



FREE!!! POWERFUL MUSCLES FAST!
Fantastic New Discoveries in the science of bodybuilding. Now, in the privacy of your bedroom, our method will add inches of powerful muscles to arms, chest, shoulders & legs. Learn secrets on trimming the waist with ultra-modern methods—fast! Results Guaranteed! Send for free brochure, Universal Bodybuilding, Box 485-MI, Dearborn, Mich. 48121.

BUILD YOUR OWN
Cabeover Campers • Covers
16' & 20' Travel Trailers
• PLANS •
PATTERNS • KITS
★ FREE CATALOG ★
GLEN L Recreational Vehicles

AS FEATURED IN JULY ISSUE
OF POPULAR MECHANICS:
LAGUNA 20'
TRAVEL TRAILER
COMPLETE PLANS AND
FULL SIZE PATTERN SET **\$15 PPD.**
Component Kits, all Equipment
and Frames Available Now!
GLEN L Send for plans and
patterns plus catalog:
9152 P-8 Rosecrans, Bellflower, CA 90706



Bartlett Flying Saucer ultra-light hovercraft powered by ordinary lawn mower engine—easy to build—fun to fly—complete plans, kit brochure, photos and supply sources \$5.00. All orders returned via airmail. Write:
HERB BARTLETT
Box 3339-M, Scottsdale, Arizona 85257

GRANDFATHER CLOCKS
SAVE 50%
BUILD YOUR OWN
GRANDFATHER AND
GRANDMOTHER
WEIGHT DRIVEN CLOCKS
• Highest Quality Imported Movements from Germany
• Tubular or Rod Chimes
• Moving Moon Dials
• Pre-cut Semi-assembled Handcrafted Case Kits (No power tools required)
• Dials, Barometers, Hygrometers, Templates and Case Plans.
All movements and dials in stock.
Send 50¢ for complete catalog
H. DeCOVNICK & SON,
P.O. Box 68, Dept. M82
Alamo, Calif. 94507
EST. 1947

TAPELESS TAPE MEASURE

New Hand-Held Measuring Instrument Obsoletes Folding Ruler, Steel Tapes— Even Measures Around Corners



Time-saving, goof-proof must for every handyman. For accurate one man, one-hand measuring up to 99 ft. 11 in.

Lightweight, compact, precision-made U.S. device skims over surfaces to revolve geared scratch-proof, skip-free measuring wheel for reliable, magnified digital read-out. Reset button lets you start all over again.

Figure lengths or sq. ft. to purchase materials without waste. For carpentry, painting, wiring, carpeting, tiling—you name it. Handier, easier to use than folding ruler or yardsticks; rugged, non-conductive, safer than steel tapes.

Send check or money order for \$7.95. Money back guarantee.

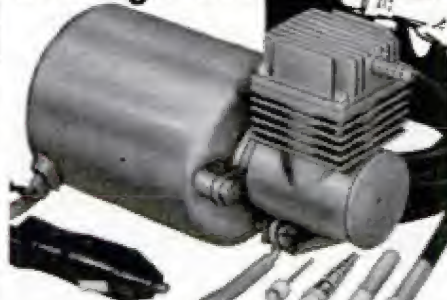
TAPELESS TAPE MEASURE
5346 Northwest Hwy. • Chicago, Ill. 60630
Another Reliable Digital Counter from ENM

DETROIT APPROVED—PICKUP TANKS
Original equip. type poly. now avail. in aux. tanks for pickups. Increase gas capacity 40 gals. Easy 1 hour installation—completely hidden—no body work necessary. Let truck discounts pay for tanks.
R.P.M. INC., Dept. PM-872
P.O. BOX 7936, Waco, Texas 76710

SOLVE YOUR PROBLEMS

Scientific. It works every time with everybody. **GUARANTEED.** Copyrighted brochure \$1, refundable with order. Achievement Motivators, Box 1282-PMB Brooklyn, N.Y. 11202.

Compressed air from car lighter!



auto-flator
• Now have air wherever you go! Even remote areas. Emergency air for tires, air jacks, space-saver spare. Inflate mattresses, boats, rafts, pools. Plugs into 12-volt system in auto, trailer, truck, boat. Space-age size . . . only 6 1/2 inches long. Amazing pressure up to 60 lbs./l Only \$29.95 (plus \$1.00 shipping) with air hose and inflator attachments. Send check or money order on 10-day, money-back, guarantee.
W. R. BROWN CORPORATION
2773 N. Normandy Ave., Chicago, Ill. 60636

MAKE BIG PROFITS ON A SMALL INVESTMENT!

Radiator repair is big business. Cash in on this rapidly growing field.

Barbee will help with a complete, free training course and a plan which lets you pay from profits!

FREE TRAINING
INVEST AS LITTLE
AS \$2000

Write for more information today.



PREVENT ENGINE DAMAGE. Ten second Oil-Chek test accurately measures motor oil contaminates and molecular breakdown point. Fits glove compartment, use over and over. Detect pollutants before they wear on engine parts. Send \$1.89 for Oil-Chek plus 50¢ for postage and handling. Fine gift item. Write Oil-Chek.

CLIFF GRANBERRY CORP.,
P.O. Box 9505, Dallas, Texas 75214.

FIND BURIED TREASURE
FIVE PATENTED MONEY SAVING DETECTORS TRANSISTORIZED FROM **17⁹⁵ 49⁹⁵**
3 SEARCH HEADS INCREASE RANGE
Finds Coins, Jewelry, Gold, Silver, Bronze
Write for FREE Catalog
SOLIDTRONICS DEPT. PA2H, TENNENT, NJ 07763

IMPORTED LOCK BLADE KNIFE
ONLY \$275 each
9" Overall Length
5" When Closed
• Sharp and Tough
• Stainless Steel Blade
Locks into position to prevent accidental closing. Razor sharp tough stainless steel blade for reliable use and hard, long service. Money back in 5 days if not satisfied. Send \$2.75 plus 25¢ to cover postage and handling.
WESTBURY SALES CO.
P.O. Box 434, Westbury, N.Y. 11590 Dept. L-210-PM

Full-size Fruit Dwarf-size Trees

FREE COLOR CATALOG features popular fruit varieties you can grow on trees only 8-to-10 feet tall. Over 400 trees, shrubs, vines, roses and plants for every home gardening need. 64 pages.



Stark Bro's
Box B37272
Louisiana, Mo. 63353

2000 NOVELTIES Free Catalog

FREE! World famous catalog of hard-to-get Novelties, Tricks, Jokes, Pranks, Hobbies, Sports, Science, Electronics, Peace & Love Gear, Mod, Psychedelic, Cloth Patches, Shirt Transfers, Lights, Jewelry, Bargains, Gadgets, Books, Games, Photo & Optical, Tools, etc. No letter necessary. Send ad name address. Johnson Smith Co., Dept. C-108, Mt. Clemens, Mich. 48043



Thousands of exciting tool values!

SILVO (BRAND NAME) TOOL CATALOG

Thousands of Exciting Tool Values! Stanley, Millers Falls, Skil, Thor, Wen, Disston, Wiss, Wellsaw, Dremel, Speedy, Sprayers, Plumb, Huot, Kennedy, Channellock, Porter-Cable, Rockwell, Helios, Vice-Grip, Crescent, Ridgid, Pony Clamps, Unimat, Foremost and many other Nationally Advertised brands of Tools & Supplies. We ship Coast to Coast at prices Hard to Beat. Send 50¢ for our big 146 page tool catalog today. Silvo Hardware Co., PM-8 107 Walnut St., Philadelphia, Pa. 19106.

Khrushchev's Wife



Khrushchev's first wife, we are told by John Nobel, a prisoner of 13 years in Communist prison camps, spent 8 years in the concentration camp of Potma, Russia. She was placed in prison by her own husband.

John Nobel adds that his wife was a Christian and was praying for Khrushchev. Khrushchev was touring the United States shaking hands and exchanging smiles with Americans. His own first wife, though, and thousands and thousands of Christians were tortured to death in Communist prisons.

A moving account of their courageous faith and stand for the Lord is contained in the book **TORTURED FOR CHRIST**, by Rev. Richard Wurmbrand, a best-seller in 27 languages.

Be interested in the plight of our persecuted brethren behind the Iron and Bamboo Curtains. You can help! Mail coupon for the book, "Tortured for Christ" by Rev. Richard Wurmbrand.

Clip and mail to:
VOICE OF THE MARTYRS 1659 PM
P.O. Box 11, Glendale, CA 91209 U.S.A.
"Remember them that are in bonds"

Name _____
Address _____
City _____
State _____ Zip _____

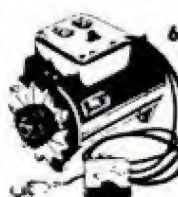
☐ Send **FREE** Book Thank You

1109 E. Chevy Chase Dr., Glendale
Telephone: (213) 247-3711



TOOL POWER™ 110 VOLTS D.C.

3,000 Watts 0-50 amps from your car's alternator. Operates heavy duty drills, saws, and lights. Battery charging. Arc welding. Does not operate A.C. motors on refrigerators and air conditioners. Installed in 10 minutes. Guaranteed 3 years. \$25.00 Postpaid. Dealerships available.



A.C. Generators
60 Cycles, 110 Volts, Fanbelt driven. Runs power tools, T.V.'s, refrigerators, radios, A.C. motors to 1/2 H.P. Cannot operate air conditioners. 1,500-watt: \$60.00 plus \$5.00 postage. 3,000-watt: \$99.50 plus \$6.00 postage. P.O. Box 7066, 2821 Mays St.

VIRIDEN PERMA-BILT CO.
PM Amarillo, Texas 79109

WATER
WATER
WATER
WATER
WATER

"HOW TO DRILL YOUR OWN WATER WELL"

\$1.00 ppd

SATISFACTION GUARANTEED

DEEPROCK CO.
OPELIKA, ALA. 36801

FACTORY CLOSEOUT!

Air Pistol \$6.95 ppd.

Shoots both pellets and darts. This fine, well made .177 cal. German air pistol is just the ticket for target or Varmints. Accurate. No CO2 cartridges to replace, either. Once in a lifetime bargain. Order several. Supply limited. Only \$6.95 ppd.

(Secret leather holster. \$2.95 ppd.)

600 Delux Pellets, \$2.40 ppd.

200 Steel Darts, \$2.00 ppd.

AIR PISTOL, Dept. PM-8
4535 Huntington Dr. South
Los Angeles, Calif. 90032



BUILD YOUR OWN BOAT & SAVE

- ★ BOAT PLANS
- ★ PATTERNS
- ★ FRAME KITS

SEND \$1 FOR 96 PAGE CATALOG NOW!

GLEN-L
9152 ROSECRANS'T

BELLFLOWER, CA 90706

PORTABLE STEAM CLEANER

Steam in 60 seconds



CLEAN: Engines—Air filters—lawn mowers—trucks—tractors

"Big enough to do the job, small enough to get there."

Fast, economical, ruggedly built. 3 year guarantee on coils & firebox. Propane fired. Weighs 120 lbs.

Auxiliary pump required on water pressures below 60 lbs. or on well systems.

WEDCO MFG. INC., Dept. M-3,
Box D, Jackson, Wyo. 83001

YOU CAN BE TALLER!



If you could grow 2-6 inches taller in one month would you spend 25¢ to discover how?

Fantastic, new breakthrough method of increasing height quickly, safely and naturally. No exhausting exercise, appliances, drugs or elevators. PLUS, results guaranteed. Air mailed Proof 25¢ only.

HEIGHT INCREASE BUREAU:
Dept. 15820
P.O. Box 146,
Brampton, Ont. Canada

BE TALLER! Girls go for tall Men.

NAME _____
ADDRESS _____
CITY _____
STATE _____ ZIP _____



POWER OUTLET

EASILY INSTALLED IN YOUR CAR
YOU DO IT YOURSELF IN MINUTES WITH SIMPLE TOOLS.

CAR POWER

3000 WATTS FROM YOUR ALTERNATOR

POWER FOR: HEAVY DUTY DRILLS • SAWS • LIGHTS
• COFFEE POTS, ETC. YOU CAN EVEN CHARGE
DEAD BATTERIES OR ARC WELD

• GUARANTEED 3 YRS.
• WILL NOT DAMAGE
ALTERNATOR

\$16.95

POSTPAID

HOLLY & P.M.-9
P.O. BOX 5321
PHOENIX, ARIZ.
85010

FOR MOTOROLA ALTERNATORS
AMERICAN MOTORS & JEEP
CAR POWER II

\$18.95

PLEASE SPECIFY WITH YOUR ORDER

BOAT PLANS-KITS



World's largest catalog, over 200 top designs for the amateur. Inboards, outboards, sail, deep vees, 8' to 57' — hydros, cruisers, house boats, ferro cement, plywood. Send \$1.00 for catalog or \$2.00 for catalog plus Boat Builder's Guide.

Other helpful books: Fiberglass-Boat Builder's Material, \$1.00 or send \$2.00, we include book, How to Fiberglass; Motor Installation — Boat Trailer Book with free plan, \$5.00; Ferro Cement-Plywood boat building book, \$6.00.

CLARK CRAFT BOAT CO.

16PP Aqua Lane Tonawanda, N.Y. 14150

STOP DRIPPING FAUCETS FOREVER



90% of faucet leaks are due to bad seats. The brass pits and corrodes. Obtaining the correct seats with washers and installing them is very difficult. There are over 100 different sizes and thread combinations available. Install **VULCAN UNIVERSAL FOREVER PREASSEMBLED STAINLESS STEEL SEATS WITH DELRIN WASHERS**. Also ends the frustration of hot water shut-down caused by expanding rubber washer.

KIT INCLUDES: 8 Seats with washers (Do the whole house and garden), Recessing tool, Anaerobic Adhesive, EASY Pictorial Instructions. \$4.95 + 50¢ shipping & handling.

Vulcan Mfg. Co., Box 33,

Dept. PM8, Grand Valley, Colo. 81635

Pat. Apl. For

POPULAR MECHANICS CARRIAGE HOUSE PLAN. A backyard storage building that isn't an eyesore. Styling blends with most homes. 10 ft., 4" x 12 ft., 4". For one complete set of construction plans, send \$3.95 to **POPULAR MECHANICS Dept. FA, Box 1014 Radio City, New York, N.Y. 10019.** For two sets (you may need one for your local building department) send \$5.49.

KWICK POWER FOR TOOLS

110 volts D.C. 3000 watts anywhere from any vehicle with an alternator. Installs permanently in 15 minutes. Operate heavy duty saws, drills, lights, heaters & many more a.c. devices. Arc weld, quick charge batteries. Will not harm alternator. \$14.95 postpaid, check or money order.



Only \$14.95

AUTO QUICK

10914 4th St., N.E.
Minneapolis, Minn. 55434

WOOD KEGS AND BARRELS

Used Whiskey Barrels \$18.50 ea. delivered (Add \$5.00 west of Mississippi)

Used nail kegs—\$2.95 ea. delivered. Also "new" pine barrels, oak tubs, wine barrels. Send 25¢ for illustrated Catalog.

CORDELL ENTERPRISES, INC.

1622 W. Morse Ave., Chicago, Ill. 60626



Easy to Build PLANS AND INSTRUCTIONS for
Go Kart\$2.00
Mini Bike\$2.00
Mini Car\$3.00
Pedal Boat\$4.00
Sail Boat\$2.00
Snowmobile Sleigh \$3.00

Mini Vehicles Plans
Dept.-C P.O. Box 92
Chazy, N.Y. 12921

Build this good looking storage building in your own back yard!



Here's a great way to take the strain off your garage. This handsome back-yard building has plenty of room for tractors, lawnmowers, bikes, tools or whatever. You can use it for a workshop, an escape room, a bunkhouse for the kids, or even a pool house.

It measures 8 feet by 12 feet; has a second floor; and can be built by most any handyman.

Plans give detailed building instructions. You probably will want to order two sets of plans as you likely will have to submit one set to your local building department.

Mail to: **Popular Mechanics**
Box 1014 Dept. CH
Radio City
New York, New York 10019

Please send me plans for Popular Mechanics' back-yard storage building as indicated below. Enclosed is my payment in full.

☐ One Set \$3.95 ☐ Two Sets \$5.49

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

EARN HIGH WAGES as a HEAVY EQUIPMENT OPERATOR



Train your way to high pay in the booming construction industry! Learn the skills you need to qualify, by actual field training on machines like the ones used by the industry. Huge training grounds in North Carolina, a million dollars worth of school-owned diesel-engined machines, experienced instructors, full 220-hour and 440-hour courses. National, the original school of heavy equipment operation, is a recognized leader. Member American Road Builders Assn., Services and Supply Division. Associate Member A.G.C. Full-time Job Advisory and Counseling Director on staff. Approved for veterans. For men ages 17 and up. Train Now-Pay Later plan . . . other payment plans also available. Write TODAY for FREE catalog and FREE copy of school newspaper reporting news of National School graduates. Accredited member National Association of Trade and Technical Schools.

NATIONAL SCHOOL OF HEAVY EQUIPMENT OPERATION, Dept. D-65
P. O. Box 8529, Moores Chapel Road, Charlotte, N. C. 28208

Please send me FREE illustrated school catalog and complete information. I understand there's no obligation.

Name _____ Age _____

Address _____ Phone _____

City _____ State _____ Zip Code _____

CLASSIFIED ADVERTISEMENTS

Rate: \$2.00 per word payable in advance each insertion. Capitalized words—75¢ per word additional. Minimum insertion ten words. To be inserted under the proper classification, copy must be in our office by the 15th of the second month preceding date of issue. The next available issue to place an advertisement in America's No. 1 Classified Section is October. The closing date is August 10th. Send remittance and order to H. E. Kappel, Popular Mechanics, 224 West 57th Street, New York, New York 10019. Please make remittance payable to Popular Mechanics.

POPULAR MECHANICS

WHEN ANSWERING ADVERTISEMENTS PLEASE USE THE ZIP CODE NUMBER

AUTOMOBILES

STOP Being robbed On Auto Repairs! Book by nationally-known auto expert shows seemingly major repairs often are just minor—shows how to easily do it yourself at great savings. \$1.95, refundable. Mears, Dept. PM872, 5363 Essex Court, Alexandria, Virginia 22311.

PATCHES Color Catalog 25¢. Shows Hundreds. Quotes Your Design. Patches, Dept. 98, RFD 1, Littleton, N.H. 03561.

OLD CAR FINDERS WANTED. We show you how to turn spare-time into spare dollars. Send \$2.00 for instructions to: **OLD CARS**—Box 367, GALT, CALIFORNIA 95632.

****AUTOMOBILE FIRE EXTINGUISHERS**** \$2.98 & \$3.98—Distributors QTY. Price 87½¢ & 99½¢ Sample of Each. \$3.50 Pre-paid. Warne, 6922 Congress, Detroit, 48207.

CD-Ignitions. Discount Prices. Rodgers, Son, Box 3583, Anaheim, Cal. 92803.

PATCHES Worlds Largest Emblem Catalog. Free. Funny, Unusual Emblems You've Never Seen! Please Send 25¢ For Postage/Handling. **FLINT MODEL**, 7190-PM Grand, Chicago, 60635.

SAVE MONEY!! End expensive auto repairs. Save on labor charges. "Auto Repair Book" shows how to do the job yourself. Act Now! Only \$1.95. Shafer Enterprises, 5031 57th Avenue, Bladensburg, Maryland 20710.

SAVE \$20.00 To \$30.00. Recondition Your Shock Absorbers Better Than Original. No Special Tools or Skills. Satisfaction Guaranteed. Instructions—\$2.00. Advance Research, Box 8834, St. Louis, Missouri 63102.

ULTRA Electronic ignition increases mileage reduces pollution easy starting 60,000 mile tune ups \$19.95 post paid. Hanson Marketing Service, 2811 N Hancock, Colorado Springs, Colorado 80907.

AUTO SUPPLIES AND EQUIPMENT

PREVENT TRAFFIC TICKET BLUES—"What to say, what not to say" when a cop stops you. Four rules that can save you \$100. Send \$2.00 for Judge Mayberry's 48-Page Booklet. Traffic Tips, Dept. PA21, Tennent, N. J. 07763.

ALTERNATOR/Generator Rebuilder's Course; Includes Tooling & Test Equipment; Write: Hedelund Engineering, P.O. Box 2127, Sepulveda, California 91343.

ELECTRONIC IGNITION: Improves performance. Eliminates tuneups. Boosts spark voltage. Only \$14.95 postpaid. Box 2002, Huntington Beach, California 92647.

NEW Highway Emergency-Safety Kit. 14 Pieces. A must for every motorist. Contains extinguisher; flares; tire inflator-sealer; "Help" flag; handcleaners. Guaranteed! Only \$12.50. Panama House, Dept. 22, Box 3118, Panama City, Florida 32401.

STARTER Rebuilding Course Includes tooling and torque testing procedures. Write: Gold Coast Alternator, P.O. Box 1134, Reseda, California 91335.

MOTALOY, Ring—Valve job while driving—\$6.00. Free literature. E&G Sales, Box 18384-P, Memphis, Tenn. 38118.

RING-Valve Job while driving, \$6.50 postpaid. (Two-\$12.00). . . . Established 1951. . . . Results Guaranteed!! Motaloy, Grantham, Penna. 17027.

100,000,000 AUTOMOBILE SHOCKS. Can Be Restored To Like New Condition. Simple. Inexpensive. Details \$2.00. Earnlees, P.O. Box 365, LaMesa, Calif. 92041.

IGNITION Kit points condenser rotor \$1.95 guaranteed. Add 10%, state make, year, cylinders, send check or money order. David Pittel, 37 Harrison Street, Oakpark, Illinois 60304.

JUDSON ELECTRONIC MAGNETO Ignition System Cars, Trucks, Boats. \$42.50 Ppd. Prompt Shipment. Emco Distributors, Box 6142-P, Hayward, California 94545.

120 VOLTS At 3000 WATTS Of electricity from ANY alternated vehicle! Operate drills, saws, wrenches, heaters, and many more AC devices! Arc weld ¼" steel! Series or parallel charge 6, 12, 24 volt batteries! Will not harm alternator! Ten minute installation! Guaranteed Five Years! Send only \$14.95 post paid for adapter—\$3.00 extra with indicator (comes on automatically when alternator produces 120 volts!) Build it yourself! Plans only \$5.00—Plus many more products!—Ask for **FREE** catalog—Creative Products, 1551 East Loop 820, Dept. M8, Fort Worth, Texas 76112.

AMAZING TRIDENT ADAPTOR Plays your cassette portable thru your car radio with full fidelity. Simply plug-in \$16.95 ppd. guaranteed. Info 25¢ refundable. Macks Gift Shoppe, Dept. 1T1, Box 377, Aurora, Ill. 60507.

INCREASE Gas mileage, improve performance. Easily understood manual, plus instruction guide: \$3.00; **SUBURBAN OIL**, Box 4017, Brighton Station, Rochester, New York 14610.

STOP Auto Theft with Auto Guard. Positive protection against master keys, jumping starter, "Hot Wiring", etc. Easy installation. One year warranty. \$6.95 ppd. Nufinds, Dept. 2C8, 132 E. 28th St., New York, N.Y. 10016.

PLATES Rings, Valves as you Drive \$5. Motaplate T.M., Box 282, Bonner, Kansas 66012.

WHOLESALE TO PUBLIC ENGINE PARTS & ENGINE KITS For all American Cars and Volkswagen. New engine parts and engine rebuilding kits at savings to 70%, buy direct from warehouse distributor. For free catalog write: Pacific Engine Parts Corp., P.O. Box 5686, Orange, Cal. 92667.

RING-Valve job while driving. Motaloy Pellets—\$6.00. Guaranteed!! Havasau Products, 23311-A Demley, Mt. Clemens, Michigan 48043.

LEARN Big Paying Auto Radiator Business at Home. Write, Excel, Box 708-PM, Brownsville, Texas 78520.

WARNINGS And TRUTHS About 110 volt alternator adapters. Build adapter for \$5.00. Complete information and plans \$2.00. Kit \$10.00. Electronics, Box 1133A, Merritt Island, Florida 32952.

JEEP Owners—V8 conversions. Read Jeep Owner's ad, page 181.

SNOWMOBILES

SNOWMOBILE Hop up accessory CATALOG. Speed and performance equipment—manifolds, exhaust systems. Send 25¢. G.E.M. PRODUCTS, Box 845, Carol Stream, Ill. 60187.

MOTORCYCLES, BICYCLES MOTORSCOOTERS & SUPPLIES

MOTORIZE Your Bicycle; Go-Kart; Snowmobile Plans! \$2.00 Each: Go-Bykco, Barnesville, Minn. 56514.

HONDA! \$25 Other Bargains. Send 50¢. Motorscooter, P443, Bend, Oregon 97701.

FUN—BUGGY Catalog. Just out. World's first, biggest, featuring ATV's, Mini-bikes, Karts. \$2.00. "How-to" plans \$1.00. Complete parts stock. Bargain prices. Brown's Motorsports, 19P Central St., Worcester, Mass. 01608.

"BUILD Popular Mechanics" **MINIBIKE** featured June 1967 issue. Detail plans, photographs \$2.50 refundable. Kits, parts, engines; factory discount prices. Catalog 25¢. Gilliom Mfg.; PMC, St. Charles, Missouri 63301.

ILLUSTRATED Catalog 25¢. Parts, Accessories. Custom Stock, most makes, models. Cycle Supply, Box 192M, Fairbury, Ill. 61739.

GO-KARTS. Mini-cycles, Parts, Wholesale Catalog 25¢. Loren Products, Danville, Illinois 61832.

MINI BIKE PLANS FREE With Purchase of Our Fully Illustrated Discount Parts Catalog. Send \$1.00 to: **MOTO CROSS ENTERPRISES**, P.O. Box 57, Philadelphia, Pa. 19105.

(Continued on next page)

SPACE, ROCKETS AND ASTRONAUTS

ANTIGRAVITY DEVICE. Brochure 35¢. AGD, Box 3062-PM, Bartlesville, Oklahoma 74003.

ROCKETS: Real flying models—flights up to 2500 ft. New illustrated catalog 25¢; Singles and multistage kit, cones, engines, launchers, trackers, rocket aerial cameras, technical information. Fast service. Estes Industries, Dept. 7-H, Penrose 7, Colorado 81240.

ROCKET Kits, engines, launchers, accessories. Send 25¢ for packet of iron-ons, decals, literature. Fast service. **ASTRONAUTICS,** Box 770, Mineral Point, Wisconsin 53565.



AVIATION

BUILD YOUR OWN MINI-BYPLANE. Put fun back into flying, aerobatic, 17' span 16' length. Complete detail plans and specifications \$6.95 postpaid. **GENDA ENTERPRISES,** 931 W. Main Street, El Cajon, California 92020.

BUILD—One-Man jet helicopter. Easy inexpensive. Detailed plans, drawings—\$5.00. Helicraft, Box 7153, Baltimore, Maryland 21218.

AIRBOAT, Propellers, Engines, Hubs, Mounts, Plans, Supplies. Corvair, V-W conversions. 15, 20, 25 H.P. removeable air drives. Kit airboats \$450.00 up. Hovercraft engines, hubs, propellers. Gyrocopter propellers. Catalog \$1.00. Banks-Maxwell, Box 3301E, Ft. Worth, Texas 76105.

AMAZING Device soars to high altitudes on thermals like a hawk! 16 sq. ft. area. Only \$1.25. B. C. Duvall, 394 Military Dr., No. Little Rock, Arkansas 72118

COMPLETE Illustrated plans for a hot air balloon you can build easily, inexpensively. Send 50¢ to: Aerostatic Design, Box 2764, New Brighton, Minnesota 55112.

STRAP-ON HANG GLIDER KITS \$145 Delivered. **PLANS** \$3 (Refundable) Includes List of Used Gliders in Stock. Cliffhanger, Box 53, Paramount, Cal. 90723.

SKIPPER Hovercraft Plans, \$5.00. Twin Engine Hovercraft Plans, \$10.00. Kits, Engines, Propellers, Accessories. Catalog, \$1.00. Arrowcraft-PH, Pearland, Texas 77581.

HOVERCRAFT

PRACTICAL DESIGN GUIDE For Airboats and ACV's. Send \$5.00 To: Palmer Aero., P.O. Box 1891, Coral Gables, Fla. 33134.



BOATS AND TRAILERS

FIBERGLASS Cloth, matt, polyester and epoxy resins. Wholesale catalog 25¢. Boat Molding book 30¢. Seifert's, Box 1206-M, Green Bay, Wis. 54305.

FIBERGLASS Canoes, Kayaks, and Duckboats. Many exciting models. Easily assembled kits. \$39.95 up. Free Literature. Riverside Canoes, Box 5595P, Riverside, Calif. 92507.

NEW 1971 Outboards . . . Top Brands . . . 4 H.P. \$139 . . . 6 . . . \$273 . . . 18 . . . \$399 . . . 40 Selectric \$638 . . . 60 Selectric \$899 . . . All Sizes . . . Literature 50¢ . . . Scott-McCulloch Parts, Electra Marine, 675 Merrick Rd., Lynbrook, New York 11563.

FIBERGLASS Cloth and resin. World's finest cloth and non-run resin, at direct mill prices Flotation foam. Complete line of plastics, silicon bronze and brass screws, save 60%. No sales tax. Boat Plans. Catalog 25¢. Freight prepaid. Stiles Boat Supply, Box 11P, Linden Ave., Mantua Hts., N.J. 08051.

CANOES! Kayaks! Factory-direct quality kits, from \$25.00. Many different models. Canvas hulls. Strongest construction materials. Free literature. Sportscraft, Box 636-P, Allentown, New Jersey 08501.

KAYAKS. Canoes, Sailboats, Surfboards. Complete plans, instructions. Free catalogue. Outdoor Sports, Box 1213-P, Tuscaloosa, Alabama 35401.

PLANS, FULL-SIZE PATTERNS, FRAME KITS With step-by-step instructions specially for amateurs. Send \$1.00 for new catalog just off press—nearly 100 pages, over 100 designs 8' to 42'; Sail, Jets, Inboards, Outboards, Cruisers, Houseboats, Hot Boats, Catamarans, Hydros, Glen Designs, 9152 Rosecrans, Bellflower, Calif. 90706.

CANOE Kits—Wood Canvas, Molded Fiberglass—Free Catalog, Canoe—Camping Log Book \$1.00. Trailcraft, Inc., Box 60686, Concordia, Kansas 66901.

LIGHTS Of all kinds, electrical accessories, portable power, cook and tableware. Free catalog. Bass, Box 901PM, Marblehead, Mass. 01945.

BOATS YOU BUILD FOR \$15.00. Prints & Patterns \$2.00. Send To: MYERS ENTERPRISE, 314 HEIZER STREET, GREAT BEND, KANSAS 67530.

BOAT KITS-PLANS AND PATTERNS-FRAME KITS World's largest catalog. Over 200 top designs. Sailboats 7'-45' Windmill, Snipe, etc. Motor sailers, trimarans, catamarans, power cruisers, houseboats, deep-V's, fishing boats, runabouts, hydroplanes, inboard and outboard. Ferro cement 33'-57' sail and power. Send \$1.00 for Plan Kit Catalog or \$2.00 for catalog plus Boat Builders Guide to: Clark Craft, 16-P Aqua Lane, Tonawanda, N. Y. 14150.

FIBERGLASS And BOAT BUILDERS' MATERIAL At factory to you prices. Cloth, resin, foam, plywood, boat nails, screws, marine equipment. Send \$.35 for catalog or \$1.00 for catalog plus book on fiberglass uses, mold making etc. to: Clark Craft, 16-P2 Aqua Lane, Tonawanda, N. Y. 14150.

BOAT Kits. Molded Fiberglass. Save money—assemble yourself. Factory molded sections bond into one-piece craft. 20 models—14' to 32' Cruisers, Runabouts, Houseboats, Sailboats. Big line accessories, motors, trailers. Easy terms. Free 80 page catalog. Luger, Dept. BC-7F, 3800 West Highway 13, Burnsville, Minnesota 55378.

CAMPERS AND TRAILERS—KITS—PLANS—

CABOVER Campers, Pick-Up Covers, 10' & 20' Trailers. Build and Save. Large scale Plans and Full-size Patterns with written & pictorial instructions. Complete accessory and aluminum covering kits. Free Literature. Glen L. 9152 PM-8 Rosecrans, Bellflower, Calif. 90706.

MOBILEHOME RV Screwdriver Kit For Slotted, Crosspoint, Clutch Head, Square Recessed Screws Plus Nutdriver, Scratch Awl \$8.86 Postpaid. Upson Tools, Box 4750, Rochester, N.Y. 14612.

DIFFERENT Expanding Campers, Mobile Homes to 56 x 100 Feet. Make, Buy, Sell. 60 Drawings \$5.00. Refundable. Survival, Box 8170, Kansas City, Missouri 64112.

MARINE EQUIPMENT AND SERVICES

MARINE Engines, conversions, parts, equipment. Catalog Free! Stokes Marine Industries, Coldwater, Michigan 49036.

CONVERT Auto engines to marine. 68 Page Catalog, 50¢. Lehman Manufacturing Company, 800 Elizabeth Avenue, Linden 4, New Jersey 07036.

MARINE Supplies, Ignition Parts. Free literature. Michael's, 991 Broadway, Bayonne, New Jersey 07002.

FREE Brochure Conversion Kits, Propellers, gears V-Drives 1/0 Drives Gas, Diesel. Starmarine, 1931 Embarcadero, Oakland, Calif. 94606.

ATHLETIC AND BODY BUILDING COURSES

"GIANT Arms." Dr. Young's. D.C. revolutionary discovery. \$2. Satisfaction or refund. Gaucho, 1769-A-7, Chicago 60690.

POWERFUL Muscles fast! Free brochure! Universal Bodybuilding. Box 4327-C, Dearborn, Michigan 48126.

NEW!!! Mr. Universe Bodybuilding catalogue—25¢. WFH, 18959 Inkster, Livonia, Michigan 48152.

ZAKALIVANYE, Russian yoga. \$5.00. Eastview Book Service, Box 7053, Ottawa-Vanier, Canada K1L 5A0.

FANTASTIC Isometric Rope Exerciser System. 5 Minutes Day Slims, Trims, Reshapes. Pocket Size \$3.95. Dorsam, 12763, Las Vegas, Nevada 89112.

"BUILD Muscles Faster!" 24 Nutritious Food Concentrates, 3 months supply \$7.00. Moneyback Guarantee. Better Health Club, Box 332-PM, Devon, Pennsylvania 19333.

SPORTING GOODS AND EQUIPMENT

GOLF SHOES—From street shoes with **ECONO-KLEATS.** Simple—Easy. Par-Grip Adhesive holds on all soles. Great for Kids. Complete Kit \$4.00 postpaid. **ECONO-KLEAT,** Box 1326, North Wilkesboro, N. C. 28659.

FREE 1972 Catalog! Guaranteed lowest prices! Rods, Reels, Lures, Accessories—Thousands of items. Cabela's, Inc., Dept. S-8, Sidney, Nebraska 69162.

FREE Catalog low direct factory prices, fishing, Hunting, Archery, reloading Camping supplies. Send today. Herbers Inc., Dept. CPM, Waseca, Minn. 56093.

FREE WHOLESALE CATALOG. Lure parts, Molds, Rod Blanks, Reels, Archery, Metal Detectors. Rare Hardwoods, Finnsports (ME), Toledo, Ohio 43614.

CROSSBOWS Powerful Accurate. Catalog 25¢. Crossbowman, Box 723PM-8, Manteca, California 95336.

NYLON JUNGLE HAMMOCK—Fits in your pocket, yet holds 500 lbs. Perfect for hunters, campers, hikers. 6.95 ea. Aries, Dept. PM, P.O. Box 2174, Rockville, Maryland 20852.

FREE: 236-Page wholesale sporting goods catalog. Write: Sportshaus/Box 18008/Cleveland, Ohio 44118.



FISHING, TACKLE, LURES

FISHERMAN'S DREAM BOOK—FREE, 170 page catalog just loaded with Hard-To-Find Fishing Tackle Specialties and Do-It-Yourself Goodies. Our 28th year. **NETCRAFT** Inc., Box 5510, Toledo, Ohio 43613.

MOLDS—For casting your own fishing sinkers. Free illustrated booklet. Reading Instrument Co., Box P-78, Reading, Pa. 19603.

BRITISH Weedless Lures. Wholesale Prices. \$5 for Samples. 50¢ Catalogue. Lakeview Imports, Box 272, North Sydney, Nova Scotia, Canada.

EARTHWORMS. LIVE BAIT

EARN Money raising fishworms for us! Exciting details free! Oakhaven—56, Cedar Hill, Texas 75104.

BIG Profits Raising Worms. Soilless Method. Three Oaks, Dresden, Tennessee 38225.

WORMBEDDING Formula, costs pennies Details. Ann Herbert, Box 2167, Nashville, Tenn. 37214M.

HOW To Make Money Raising Fishworms. Details Free. Specpro, Department P0182, 2927 Curran, Louisville, Kentucky, 40205.

LARGEST Wigglieest Wigglers . . . Fishing-Compost-Profit . . . Soilless-Nograin-Nocost . . . Free Proven Guide With . . . 2,000—\$7.50 . . . 5,000—\$12.50 . . . 10,000—\$20.00 . . . Nunbetter! . . . Why pay more . . . Organics, Route 1-M, Texarkana, Arkansas 75501.

(Continued on next page)

EARTHWORMS, LIVE BAIT

(Continued from preceding page)

GROW Fishworms. Outstanding new breed produces great profits. Free Literature. Fain's Hatchery-31, Edison, Ga. 31746.

DOGS AND KENNELS

LOOKING For a Special Puppy—Send \$1.00 for catalog with prices and information on more than 100 breeds. Hoppe's Kennels—Rt. 2A—Hill City, Kansas 67642.

POULTRY AND GAME BIRDS

QUAILS, Incubators, cages, supplies catalog. Marsh, 14216 Brookhurst, Garden Grove, Calif. 92643.

RABBITS—CHINCHILLAS—FUR BEARING ANIMALS

RAISE Chinchillas. Guaranteed income. Catalog \$1.00. DeShon Chinchilla, Route Two, Roanoke, Indiana 46783.

RAISE Rabbits for us, \$500 month home facts. 48 page illustrated book describing 25 breeds. Housing, breeding, feeding, markets, marketing etc. 25 cents. American Rabbit Association, 36 Arba Building, Pittsburgh, Penn. 15217.

AMAZING PROFITS! \$10,000 Yearly Raising Rabbits for Wool and Breeding. Details 25¢ coin. American Angora, Malta 12, Montana 59538.

MAKE Big Money Raising Chinchillas, Cavies, Rabbits for us. Catalog 25¢. Keeney Brothers, New Freedom, Pa. 17349.

\$500-\$1000 MONTH Plan Raising Rabbits For Us. Free Details. White's Rabbitry, Mt. Vernon, Ohio 43050.

CHINCHILLA INCOME GUARANTEED. Terms. 25¢. Bulletin \$1.00. Chinchilla, 11PM, Port Richey, Fla. 33568.

PETS—BIRDS, CATS, HAMSTERS, ETC.

PETS, Reptiles, raccoons, skunks, squirrels. Catalogue 25¢. Trails End Zoo, St. Stephens, S.C. 29479.

BUY Direct—Save: Mammals, Birds, Reptiles, Wildlife Books. Catalog 25¢. Exotic Animal Importers, Inc., Box 1675, Miami, Florida 33138.

AQUARIUM Plants, Supplies, 50¢ (Refundable) for Catalog. StanBooz, 232-PM, Southampton, Pa 18966.

HORSES, LIVESTOCK

"HOW TO TRAIN HORSES"—FREE Book tells how to break, train, make money with horses. Beery School, 1108, Pleasant Hill, Ohio 45359.

CAMPING EQUIPMENT AND TENTS

FREE 112-Page Catalog! Backpacking, Camping, Boating Supplies. Clothing. Wildwood Tents. Laacke & Joys, 1439 N. Water, Milwaukee, Wisconsin 53202.

FOLDING Charcoal or wood grill 11½x17½ cooking area. Satisfaction guaranteed. Send \$9.95 to: Lee Enterprises, 1308 Tusculum Blvd, Greenville, Tenn. 37743.

CAMPING

CAMP BOX—Unfolds into kitchen. Only 16x18x27. Provides 14 sq. ft. table area. Holds stove, lantern, utensils. Plans \$2.00. Amelia Enterprises, Box 734, Chatsworth, California 91311.

ELECTRICAL SUPPLIES

METERS—Surplus, new, used, panel and portable. Send for list. Hanchett, Box 5577, Riverside, Calif. 92507.

TRAVEL & RESORTS

PROFITS FROM CLASSIFIED ADVERTISING! Booklet shows you how to start your own business with Classified Advertising. Only \$1.00 (Refundable with first order.) C. A. MARTIN, POPULAR MECHANICS, DEPT. PMP, 224 WEST 57 STREET, NEW YORK, N.Y. 10019.

BATTERIES, GENERATORS

BATTERY Reconditioning Kit, includes molds, material, instructions. Battery Shop, Box 820, La Quinta, California 92253.

BATTERY Terminal Protectors Stop Battery Corrosion. Free Literature. Pracna's, 3301 Buchanan Road, #83, Antioch, California 94509.

ENGINES, MOTORS, MAGNETS

REPAIR Your own electric motors new book copyrighted, \$4.95. Money Back Guarantee. Gift House, Dept. PM, Blacksburg, S.C. 29702.

WINDING Data, 275 motors, \$1.25. Data Company, 512 Kensington, Kansas City, Mo. 64124.

ELECTRIC MOTOR SUPPLIES! Rewinding data! Catalog! Modequip, Box 7266, Kansas City, Mo. 64113.

MACHINERY, TOOLS AND SUPPLIES

NEW! MONEY SAVING CATALOG. CCTV, Alarms, Extinguishers, Everything in Safety Equipment. 25¢ refundable. Fire Safety Equipment, 232A Windsor Parkway, Hempstead, N.Y. 11550.

CEILING FANS. Completely assembled. Install yourself. Lowest prices. Guaranteed. Delaware Electric, 111 South Delaware, Yardley, Penna. 19067.

MICROMETERS—Indicators, Steel—Aluminum—Brass. Maximat, Unimat Lathes. Complete mailing—50¢. Campbell, 1424 Barclay, Springfield, Ohio 45505.

SMALL Foundry furnaces. Supplies. Free literature. Pyramid Products, 3736 South 7th Avenue, Phoenix, Arizona 85041.

WINCHES And **HOISTS.** Choice of 12 volt or 110. Reversible, compact, fast, ¼ ton to 1 ton capacity, from \$49.95. 25¢ brings 16 page full color catalog. Refundable. Superwinch, Inc., Dept. PM, Pomfret, Connecticut 06258.

MAXIMAT, Unimat Sale. Amazingly low prices. Deco-M, 562 Howard Avenue, Staten Island, N.Y. 10301.

PORTABLE Sandblaster \$21.00 (air-compressor required). Free brochure. Inka, Box 66573-A, Houston, Texas 77006.

MAXIMAT, UNIMAT Save at our low prices. Pioneer Electric, Box 7X, Brentwood, New York 11717.

END Mills. Lathe Milling Attachments: Information. Potter, Box 73, Cedar Rapids, Iowa 52406.

BEARINGS. Oil-Impregnated, discount price information write: Roll, Box 52, Warrington, Pa. 18976.

SCREWS, Washers, Bolts, Nuts Assortments, Plumbing, Tools, Drills, 25¢ For Catalog. Nutty Co., Box 1576 SMSP, Fairfield, Conn. 06430.

METAL Cutting Lathe \$62.50. Milling Drilling Attachment \$27.50. Tool, Material Bargains. Complete Listings 50¢. Refundable. Taig Mfg., 15048 Proctor, Industry, Calif. 91746.

WELDING, SOLDERING, PLATING

WELDGUN Arc-Spot Welder (ACDC) Patented. Drawings, Parts List—\$3.00. Speedline, B458, Woodriver, Ill. 62095.

MORRIS Welders—110/220, 170, Amps, \$59.50. 1070 Inner, Schenectady, New York 12303

PLATING Manual! New! Complete! Copper, Nickel, Chrome! \$3.00. Guaranteed! Qrew, Box 8-D, Bourbonnais, Illinois 60914.

WELDER'S TEST GUIDE \$4.00, Guaranteed. Free information. Everett Smith, Box 1688, Inverness, Florida 32650.

WELDER. Variable amps for motors, etc. Costs pennys. Plans \$1.00. Lacey, Box 21, Yorba Linda, Cal. 92686.

PLATING Equipment, Portable Platers, Supplies, and "Know-How". Build your own tanks for nickel, chrome, etc. Easy-to-install PVC liners. Rectifier components—all sizes. Schematics, parts lists, formulas, operating instructions for all plating. \$10.00 post-paid. Guaranteed to save you 25%-75% or immediate refund. Some good used units for sale. Platers Service Company, 1511-A Esperanza, Los Angeles, California 90023.

GOVERNMENT SURPLUS

GOVERNMENT Surplus. Complete Sales Directory \$1.00. Surplus Publications, Box 26062-M, Los Angeles, California 90026.

JEeps!!! Pickups!!! 100,000 items direct from GOVERNMENT. How? Where? YOUR AREA. Latest information: \$2.00. MONEY-BACK GUARANTEE. Dependable, Manual #115, Box 113, Vista, California 92083.

GOVERNMENT SALES. How and Where to Buy SURPLUS. NATIONWIDE Locations. Post Card Brings particulars. AUCTIONEERS, 1698 North Lexington, St. Paul, Minnesota 55113.

NO CATCHES. Buy any surplus direct from U.S. gov't. All information \$2.00. Bridgeworth, P.O. Box 2292-C, Vancouver, Washington 98661.

GOVERNMENT Surplus. How and Where to buy in Your Area. Send \$1.00. Surplus Information, Headquarters Bldg., Box 30177-PM, Washington, D.C. 20014.

1972 SURPLUS Army, Navy store, 52 Page illustrated catalog. Send 50¢. Ruvel, 3037 North Clark, Dept. 8-J, Chicago, Illinois 60614.

JEeps \$52.40. Airplanes \$75.01. Typewriters \$6.70. Boats \$7.50. Direct from Government. Directory and Surplus Catalog \$1.00 (Refundable). Midwest Surplus, Box 401-PM, Dayton, Ohio 45401.

JEeps! BARGAINS! How, Where to Buy Wide Variety of Surplus Bargains from Government. Rush \$2.00 Now for Manual #G2. Surplus, 1811 Vintner, Pleasanton, California. 94566.

GOVERNMENT Surplus Official Guide How And Where To Buy Government Surplus Only \$1.00. Enterprizes, 3263 Lucerne Ave., Lake Worth, Florida 33460.

JEeps Typically From \$53.90 . . . Trucks From \$78.40 . . . Airplanes, Typewriters, Boats, Clothing, Camping, Sporting, Photographic, Electronics Equipment. Wide Variety. Condition. 100,000 Bid Bargains Direct From Government Nationwide. Complete Sales Directory and Surplus Categories Catalog \$1.00 (Deductible First \$10.00 Order From Our Separate included Catalog). Surplus Service, Box 820-A, Holland, Michigan 49423.

1000 KNIVES. All Kinds!!!! Government Surplus, clothing, tents . . . Illustrated catalog . . . Send five 8¢ stamps . . . B.W.T., Box 692-49, Newark, Ohio 43055.

JEeps . . . Buses . . . Vans . . . Trucks . . . Automobiles from \$52.50. Airplanes, Boats, Typewriters. Direct From Government. Directory and Surplus catalog \$1.00 (Refundable). Southern Surplus, Dept. PM-3, Manchester, Kentucky 40962.

JEeps From—\$52.50; Typewriters from —\$4.15; Cars from—\$31.50. Walkie-talkies, motorcycles, airplanes, boats. Typical "As Is" bid bargains from Uncle Sam. Tremendous variety. Exciting free list. Write: Enterprises, Box 402X79, Jamaica, New York 11430.

(Continued on next page)

HOBBIES AND COLLECTIONS

COLLECT Military Medals, list 25¢. Vernon, Box 387PM, Baldwin, N.Y. 11510.

50 GORGEOUS Jungle Butterflies \$2.90. Collectors Wonderland, Box 1170, New York 10008.

EXOTIC Artifacts and Tribal Art. Old cultural and ceremonial objects from around the world. Highly detailed lists \$2.00 (refunded first order). M. Koehler, P.O. Drawer 56160, Harwood Heights, Ill. 60656.

SHOULDER PATCHES—Collectors Items Official Apollo patches one dollar each Postpaid, U. S. Army and Air Corps patches 10 assorted patches, price list and catalog \$3.50. Catalog only 50¢. Special Patches made to order. Minimum 114 patches. Catalog \$1.00. Patches By Springer, Box 1771-PM, El Paso, Texas 79949.

BUILD Your own reflector telescope. ESCO is back. Do-it-yourself reflector telescope kits. Send for details. See the moon and stars. Mirrors and lens kits. ESCO Products, 171 Oak Ridge Road, Oak Ridge, N.J. 07438.

1000 CATALOGS Listed and described. Sources for everything imaginable. \$2.00. **MAST-R-LOG**, Box 24413, Oakland, California 94623.

DECALS, EMBLEMS, PATCHES

NASA Contract supplier offers authentic Apollo 4" diameter flight patches at \$2.00 each. Souvenir 3" size, \$1.00 each. Apollo 7—16 set of ten in 4" size, \$17.50. 3" size set \$8.00. As supplier to the world's largest corporations, we offer custom embroidered patches from 25 pieces to 25 million. Lowest prices. Fastest delivery. Design-An-Emblem Guide plus free sample emblem: 50¢. A-B Emblem Corporation, Box 5695, Weaverville, North Carolina 28787.



STAMP COLLECTING

STAMPS FROM 88 COUNTRIES—Only 10¢! Worth \$5.00 at catalog prices. Incredible collection of genuine postage stamps from 88 different countries—from Afghanistan to Zambia, North to South Pole! Stamps nearly 100 years old, New Issues, Moon and Outer Space stamps, etc. All for only 10¢. Also, other exciting stamps to examine free. Buy any or none, return balance, cancel service anytime. Plus Wonderful Free Catalog! **H. E. HARRIS**, Dept. AS-11, Boston, Mass. 02117.

SEND Only 5¢ for Worldwide Collection of over 50 different Singapore, Grenada, Chad, etc. Contains old and new issues, sports, animals, etc. You will also receive interesting lists and a certificate worth 50¢ toward purchases. Goliath Co., Dept. TP-1, Bethlehem, New Hampshire 03574.

SURPRISE Collection! Exotic mint British Colonials absolutely free with approvals. Viking, Great Neck, 8 N.Y.

SEND Only 10¢ for nice collection of U.S. stamps including "\$5.00." Issue and scarce mint Sipex Souvenir Sheet. You will also receive the most wonderful catalog of stamp offers in America. Littleton Stamps, Dept. SS1, Littleton, New Hampshire 03561.

200 DIFFERENT 15¢ With Approvals. Polze, Box 5215, Milwaukee, Wisc. 53204.

GOLDEN OFFERS!! MANY Repeat Orders. U.S. Super Missions mixtures, with many better issues. 3,000 \$2.80, 6,000 \$5.00. Pound Each: Luxury Foreign many commemoratives \$7.25. Beautiful England \$5.25. Colorful World-wide from 50 Countries \$5.00 2 Pounds \$9.50. Cigar Box Foreign Treasure lots selective issues. \$5 and \$10. Exciting dream sample \$1.25. Rebello Stamps, Box 13542-B, St. Louis, Missouri 63138.

TEN Different Nudes: 20¢. Approvals. Stamp Farm, 2M45, Oxford, Wis. 53952.

WOW! 110 All Different Germany 10¢. Commemoratives, Airmails, High Values, Big Catalog, bargain lists. Also, fine stamps from our approval service, which you may return without purchases and cancel service at any time. Jamestown Stamp, Dept. A82PM, Jamestown, N.Y. 14701.

FREE! Big Bargain Catalog—New Edition listing thousands of bargains including U.S. & B.N.A. stamps, packets, albums, accessories and supplies. Also, find stamps from our approval service which you may return without purchases and cancel service at any time. Jamestown Stamp, Dept. E82PM, Jamestown, N.Y. 14701.

WHOLESALE Prices. Approvals, write. Merlo, 1527 Anderson Avenue, Fort Lee, New Jersey 07024.

FREE World Collection. Over 100 stamps. Approvals. Global, Box 427, Livermore, Cal. 94550.

5000 Foreign \$3.00; 9000 \$5.00; 5000 USA, contains airmails, presidentials, revenues, 19th century, high values, commemoratives, etc. \$3.00; 300 pre-1940 USA commemoratives \$2.00; 700 \$4.00. No approvals. Meyers, 5321 Fleming, Richmond, California 94804.

200 BEAUTIFUL BRITISH ASIAN And **WORLDWIDE** Issues Sent To Approval Applicants For 25¢. Trans-Global Stamp Co., Dept. E, P.O. Box B, Baltimore, Maryland 21228.

APOLLO 11 Moonlanding. Seven multi-colored giants from Guinea, catalog value \$3.41. Only 10¢. Topical approvals. LeBlanc, Box 110-P1, Glen Cove, New York 11542.

ONE CENT STAMPS. Write for jumbo books of stamps at 1¢ each, mounted in Scott order. **BULLOT APPROVALS**, 6815 Bay Pkwy, Brooklyn, N.Y. 11204.

50 DIFFERENT U.S. Commemoratives 25¢ Approvals. We pay postage. Craig Stamps, Box 118-N, Belmore, New York 11710.

"AFRICA" 25 Beauties, 10¢. Approvals. Gorliz, Box 28765 PM, Memphis, Tennessee 38128.

100 DIFFERENT United States Stamps, 25¢. With U.S., Foreign Approvals. ShelRon, Box 547C, North Miami, Fla. 33161.

U.S. MINT Specials! Flag set, complete \$1.00. 1¢, 2¢, 3¢ famous Americans (21 different) \$1.00. Free list. Brooks, 2601 Avenue "U," Brooklyn, N.Y. 11229.

PENNY! Approvals! Regardless catalogue! Kloster, 4164 52nd St., San Diego 5, Calif. 92106.

U.S. BARGAIN, 50 Different 10¢, with beautiful worldwide, approvals. Stamp Center, Kennebunk, Maine 04043.

FREE Surprise collection sent with approvals. Gould, 1784 Union, San Francisco 94123.

PENNY Stamps! 1000 Mounted in book at 1¢ each! Trust Stamp Company, P.O. Box 100-P, Jamaica, New York 11435.

ABSOLUTELY Free United States Mint Souvenir Sheet When Requesting United States Approvals. K&B, Box 70, Brooklyn, N.Y. 11223.

500 DIFFERENT Stamps. \$1.00. Smith, 508-A Brooks, College Station, Texas 77840.

14,000 DIFFERENT! AMAZING New plan builds your collection systematically, country by country. Only 50¢ weekly. Ware, Monroe, Conn. 06468.

210 DIFFERENT U.S. Commemoratives \$1.00. Stamps, 7607 Larchview, Dallas, Texas 75240.

AMERICANS On foreign stamps, Presidents, Kennedy, Roosevelt, Lincoln, U.S. Spacemen, Princess Grace and others. 10¢ with approvals. Roseland Stamps, Dept. 57, Spring Lake, Michigan 49456.

FREE: First UN Stamps Issued. Approvals. Chapman, Box 487N, Galesburg, Mich. 49053.

FAR EAST ASSORTMENT—VIET NAM, JAPAN, KOREA, Formosa and others only 10¢ with world wide approvals. Clark Stamps, Dept. 57V, Muskegon, Michigan 49444.

100 CANADA 25¢. Excellent value. Approvals. Continental, Limehouse, Ontario, Canada.

FREE Duplicate Exchange—2¢ Approvals. Belden, Box 4175B, Dearborn, Michigan 48126.

100 DIFFERENT British Empire 10¢. Approvals. Gibson, Box 34, Lansdowne, Pa. 19050.

80 DIFFERENT U.S. Stamps. Includes 1943 flag stamp of occupied nations. Only 25¢. Approvals included. Willett Co., Box 338-M, Yorktown Heights, N.Y. 10598.

50 YEARS Old, fifteen different United States, over fifty years old—10¢ with approvals. Jaxon, Box 145-P, Brooklyn, New York 11230.

307 DIFFERENT Triangles, Sports, Topicals, etc. Worth near \$8.00. Only 25¢. Bargain approvals. Jayto Stamps, East Syracuse, New York 13057.

NEW! Get scarce Vietnam, Tanzania, Cook Islands Royal Visit, Monaco Royal Wedding plus F.D.R., Stalin, Churchill memorial issues, many more. Valuable collection of 100 different stamps from far-away places. Strange beasts, famous people, rare paintings. Also stamp selections to examine. Buy any or none, return balance. Cancel service anytime. Rush 10¢ handling. Garcelon Stamp Co., PM9K, Calais, Maine 04619.

60 DIFFERENT United States (30 Commemoratives) 25¢. Seidenberg, Salem 169, Oregon 97308.

QUALITY AND LOW PRICE. EXCELLENT For advanced or beginner. Mounted approvals 2¢ up, all countries in Scott's Order. Preview Stamps, P.O. Box 20667, San Diego, California 92120.

BEAUTIFUL TOPICAL COLLECTION—Includes Olympic sport stamps, wild animals, bicolor triangles, colorful birds, outer space stamps, Poland kitten stamp and others. 10¢ with approvals. Sunny Stamps, Dept. 57A, Fruitport, Mich. 49415.

SENSATIONAL Clearance Sale. 10 packets-25, 20 packets-50, 40 packets-\$1.00. No Approvals. Norge, Wyckoff, N.J. 07481.

NEW AFRICAN STAMP COLLECTION including Burundi, Guinea, Mali, Rwanda, Togo and others. A colorful addition to your collection, 10¢ with approvals. Modern Stamps, Dept. 57B, Ferrysburg, Michigan 49409.

LOOK! Over 100 different strange and valuable stamps for just 10¢ with approvals, plus big bargain lists. Continental, Box 9413, North Hollywood, Calif. 91609.

"INVERTED Error" Dag Hammarskjöld, 10¢ with approvals. Belmont Stamps, Washington, D. C. 20015.

SENSATIONAL Free Offer. 20 Outer Space Stamps. Selected Approvals. Louis Morrison, 1027 Maryland, Cape May, New Jersey 08204.

100 OLD United States between 1861 and 1935. \$1.00. Ed Roush, 423 Shepard, Mansfield, Ohio 44907.

WORLD Wide stamps 2¢ each! Write for exceptional approvals. Pan Pacific, Box 1895F, Studio City, Calif. 91604.

MILLIONS Of stamps 2¢ each. Write today for gigantic selection. CSC, Box 9384, No. Hollywood, Calif. 91606.

225 STAMPS For only 10¢! Airmails. Pictorials: stamps from strange countries cataloging up to 25¢ each! Plus unusual stamps to examine. Buy any or none return balance, cancel service anytime. Mystic Stamp Co., Camden 80, New York 13316.

(Continued on next page)

STAMP COLLECTING

(Continued from preceding page)

WANTED—New Issue Subscribers, Specialty Israel, Western Europe, Great Britain. Advise your references, small advance over **FACE VALUE**. Franklin, P.O. Box 467 B, Jamaica, New York 11434.

PIONEERS Of the Air Age—first flight covers. Postal markings tell historic data. Real collectors' items now. \$1.00 each or 4 all different flights for \$3.25. K.M. Walsh, Box 308-F, Tuckahoe N.Y. 10707.

COLLECTION Free: Pictorials-Commemoratives. Approvals. Ross, Box 564-PM, Yonkers, New York 10702.

50 U. S. COMMEMORATIVES 15c. Approvals. Cambridge, Box 2311, Heath, Ohio 43055.

OLDER U.S. STAMPS, COVERS. On approval to adults only. Surprisingly good. Engle, Box 208P, Lowell, Michigan 49331.

1c, 2c APPROVALS. Other Bargains. Pam, Box 22092, Memphis, Tenn. 38122.

"WHOLESALE" U.S.—Foreign Pricelist and catalog Free! Everything Guaranteed. Schneider, Box 1240, Grand Rapids, Michigan 49501.

300 DIFFERENT 30c Bargain lists. No approvals. Stamps, Box 27, Fremont, Michigan 49412.

YOURS FREE! 40 RED CHINA Postage Stamps banned to American collectors for a generation by U.S. Gov't. Now at last you can legally own them; and these stamps are so worth having that experienced and beginning collectors alike want them—so act fast, because supplies are strictly limited! You also get 110 other stamps from Britain's Lost Empire plus illustrated Album to keep as a Bonus should you buy \$1 from our Approval Selection. Or return Album and 110 stamps with selection and buy nothing. Cancel service anytime. But Red China stamps are yours to keep! Send 10c for mailing while supplies last. Kenmore, Milford RC-200, New Hampshire 03055.

QUALITY Foreign Approvals! Pictorials, Topicals, etc! Old and new, 2c-3c each. Write today! Schmidt, Box 634-M Station A, Richmond, Calif. 94808.

107 BRITISH Colonies. Terrific bargain. 25c. Approvals. Castle, Box 15-PM8, Flushing, New York 11352.

"CONQUEST Of Mars". Yemen's Latest Collection. 10c With Space Approvals. Potomac Stamps, Washington, D.C. 20015.

50 DIFFERENT Worldwide and List 10c. Royale, Box 8027-P, Long Beach, California 90808.

FREE, Mint Worldwide Packet. Approvals. Hildebrand, Box 5645, Redwood City, California 94063.

400 MIXED U.S. 20c Approvals. Wright, Box 753-M, Hagerstown, Maryland 21740.

FREE! Qatar, Rwanda, Selangor, Others. Approvals. Keating, 2520 Boulevard, Jersey City, New Jersey 07304.

200 DIFFERENT Large pictorials \$1.00. Worldwide approvals. Quynn's, Scotland, Penna. 17254.

ASIA-50 Exotic Beauties 10c! Bargain Approval Selection Accompanies: Arnim Belke, 1824 Gates, Brooklyn, New York 11227.

100 DIFFERENT Large US Commemoratives. Regular \$5.00 value, only \$2.00. Quality Topical, 3381 Clearview, Columbus, Ohio 43221.

RWANDA'S Latest Bicolored Animals—Buffalos, Zebra, Rhinoceros—Free! Approvals plus 101 Bonus Sets. William Deems, 226 Race, Ravenswood, West Virginia 26164.

UNITED NATIONS MINT. Set A—50c. Set B—\$2.50—Recent Issues. Leiman, 1445-44 Street, Brooklyn, New York 11219.

ITALY—50 Different 10c. Approvals. Hijop, Box 505, Norristown, Pa. 19404.

NEW Issues—Free Weekly Illustrated list. Brooks, 2601N Avenue "U", Brooklyn, N.Y. 11229.

COINS, TOKENS, CURRENCY

SEND Only 5c for valuable booklet "How To Collect Coins" which is loaded with expert advice. You will also receive 5 different foreign coins and your copy of the most unusual and interesting collectors catalog available anywhere. Littleton Coins, Dept. VB-1, Littleton, New Hampshire 03561.

LIBERTYHEAD Quarter, Libertyhead Dime, Libertyhead Nickel, Indianhead Cent (Quality Coins), plus illustrated list, all for \$2.00. Eagle Coin, Box 25231, Richmond, Va. 23260.

COIN Approval Service. Wholesale Prices. Write. Merlo, 1527 Anderson Ave, Fort Lee, New Jersey 07024.

WORLD'S Greatest Coin Collectors Magazine, 1913 Liberty head nickel brings \$50,000.00, huge buy and sell section, sample copy 10c. Also genuine wooden nickel. 10c. Lawrence, Anamosa, Iowa 52205.

3 DIFFERENT Silver Dimes, only 50c. Stevens, Box 546F, North Miami, Fla. 33161.

SILVER DOLLARS Uncirculated, 1880-81—1883-84-85 \$4.50 Ea. Catalogue 50c. Shultz, Salt Lake City, Utah 84110.

COMPLETE U.S. Coin List 25c. Lincoln Starter Sets 50 Different \$1.75, 100 Different \$3.50. Schultheis, Box 2151M, New Hyde Park, N.Y. 11040.

PRICE Lists of Thousands of Stamps and Coins. Send 25c Refundable with purchase. No Approvals. Bryson, 612M White, Toledo, Ohio 43605.

40 MIXED, Indianhead And Lincoln Cents 1890's To 1930's \$2.00. Pavley, Box 518, Cupertino, California 95014.

15 COINS From 15 countries. \$1.00. Robert Getts, 250 Mamaroneck Ave., White Plains, New York 10605.

1971-S PROOF Kennedy Half, \$4.50. Catalog 25c. Village Coin Shop, Dept. P, Plaistow, NH 03865.

LINCOLNS 1909-1958 Every year including 1909VDB, 1922D, 50 different (Regularly \$12.60.) **SPECIAL** \$6.95. HARRIS, Box 2037P, Santa Cruz, California 95060.

CLEARANCE Ten Silver Dollars \$15.00. Lee LTD., 331 W. Pender Street, Vancouver, Canada.

1971 PROOF Set \$7.69; Uncirculated Year Set \$3.69, 1973 Redbook \$2.49, Buy/Sell \$1.49, Bargain Lists 18c. Bebee's, Incorp., Omaha, Nebraska 68111.

LINCOLN CENT COLLECTION 62 Different (1909vdb—1948). Including 1909vdb, 1943pds, album. \$5.95. Five sets \$27.50. Rodney Tuttle, 3946 58th Street, San Diego, California, 92115.

COLLECT COINS For Profit! How to Start, Where to Sell. Get our List of Valuable Coins. Send \$1.00. Service Line, 463 Kissel Avenue, Staten Island, New York 10310.

GOLD COINS Of the World. Beautiful Low Prices. Plus thousands of United States Coins. Free price list. Please send long, airmail envelope. Self-addressed, stamped. Silver Center, Box 22171-M, San Francisco, California 94122.

1949-S LINCOLN 10c. **FREE** Bargain List. Ron Farley, Metamora, Ill. 61548.

ANTIQUES, RELICS, INDIAN GOODS & CURIOS

APACHE Arrowhead Collection 9, \$2.00. 25 for \$5.00. Epanco, PM 1239, Apache Junction, Arizona 85220.

INDIAN Relic list, Arrowheads \$4.00. doz. Folsom. \$5.00 each. C. Secrist, Deerfield, Missouri 64741.

LIST Indian relics. 10 Arrowheads \$3.00. Hyde's, Box 2304, Santa Fe, New Mexico 87501.

SELLING 20,000 Indian relics, Arrowheads, spearheads, tomahawks, ceremonials, etc. List 10c. Lear's, Glenwood, Arkansas 71943.

EVERYBODY LIKES DIXIE GUN WORKS.

TONS Of antique gun parts and supplies. All reproduction muzzle loading guns. Send \$2.00 for enlarged illustrated catalog No. 121. Dixie Gun Works, Union City 12, Tennessee.

MODELS—CARS, SHIPS, TRAINS, PLANES ETC.

SHIP Models Kits, fittings, plans, books, tools, engines, motors. Big illustrated catalog 50c. Mass. residents add 3% tax. James Bliss & Co., Dept. SM, Route 128, Dedham, Mass. 02026.

SHIP And yacht model fittings: Pine construction hull kits; blueprints. Send 50c for illustrated catalog. A. J. Fisher, Inc., 1002 Etowah Avenue, Royal Oak, Michigan 48067.

MODEL Airplanes—Big 220 Page Catalog \$1.00. Sig Company, Montezuma, Iowa 50171.

SHIP Models Catalog 25c. Scientific, Inc., 340 Snyder, Berkeley Heights, N. J. 07922.

LIVE Steam powered backyard railroads! All sizes. Complete "bolt-together kits," and rough castings. Excellent drawings. 100 page catalog \$1.00. Little Engines, Lomita, California 90717.

ROCKETS: Real flying models—flights up to 2500 ft. New illustrated catalog 25c. Single and multistage kits, cones, engines, launchers, trackers, rocket aerial cameras, technical information. Fast service. Estes Industries, Dept. 2-H, Penrose, Colorado 81240.

MODEL Airplanes—**DISCOUNTS**—Big Catalog 50c. Refundable. Dave, Box 543, Soquel, California 95073.

ROCKET Kits, engines, launchers, accessories. Send 25c for packet of iron-ons, decals, literature. Fast service. **ASTRONAUTICS**, Box 77E, Mineral Point, Wisconsin 53565.

GAMES, TOYS, PUZZLES, NOVELTIES

WORLD'S Largest crossword puzzle! Over 4,000 words! Over 2' square! Only \$3.98. Sincerely Yours, Box 532, Bronxville, New York 10708.

SOLID WALNUT "T" PUZZLE. Terrific for executive desk-tops, \$2.00. Gift-Craft, Box 532, Lake Ronkonkoma, N.Y. 11779.

NOVELTIE Catalog. Send 8 cent stamp. Tam Enterprises, Box 66278, Los Angeles, California 90066.

MAGIC TRICKS, JOKES, VENTRILOQUISM

HOUDINI'S Greatest Magic!! You can do them all!! Giant illustrated Catalog 25c with Free Trick!! Vick Lawston, Box 2026P, Pompano Beach, Florida 33061.

NEW 1972 Large Catalog. Be popular! Amaze! Have fun! Send 10c. Latest Magic for pocket, parlor, stage. Jeffries Magicland, Dept. 11, Dallas, Texas 75201.

FREE! World's Leading Catalog 2000 Novelties, Jokes, Tricks. Scientific Gadgets, Hobbies, Johnson-Smith, C-10, Mt. Clemens, Michigan 48043.

VENTRILOQUISM! Learn at home! Guaranteed! Write! Information Free! Dummy Catalog 25c. Maher, Box 9037P, Denver, Colorado 80209.

HOUDINI'S Original Magic Shop. Established 1856. Send 25 cents for illustrated Catalog containing 5000 Tricks. Mindreading, Puzzles, and Jokes. Flossie-Hornmann, 304 West 34th St., New York 10001.

(Continued on next page)

MAGIC TRICKS, JOKES, VENTRILOQUISM

(Continued from preceding page)

MAGIC, NOVELTIES, MASKS: Catalog 15¢. Magic, 3746 West 63rd Street, Chicago, Illinois 60629.

COMPLETELY Illustrated catalog. 84 pages. 25¢. Manhattan Magic, Box 334-M, N.Y.C. 10011.

BE A Magician! Two booklets explaining sixty-eight tricks plus large professional catalog. \$1.00. Magic Inc., 5082 Lincoln, Chicago, Illinois 60625.

WORLD'S Finest professional magic tricks. Joker's Novelties. Giant illustrated catalog 10¢. Top Hat, Evanston, Illinois.

FABULOUS MAGICS New 1972 catalogue 25¢. Our specialty orders shipped same day no substitutes. Fabulous Magic, 3319 East Charleston, Las Vegas, Nevada 89104.

MAGIC MAGAZINE—Monthly since 1936. 44 pages. All phases. 3 month trial \$1.00. Genii, P.O. Box 36068, Los Angeles, Calif. 90036.

LEARN VENTRILOQUISM! Dummies, Puppets, Marionettes. Catalog 15¢. Izzy Rizzys Ventriloquism School, 3746 West 63rd Street, Chicago, Illinois 60629.

BOOKS, CATALOGS, NEWSPAPERS

BIG FREE CATALOGUES On HEALTH, REFERENCE, CLASSICS and SELF IMPROVEMENT BOOKS. Box 736, Norwalk, Cal. 90650.

PAPERBACKS Sold or Swapped. Catalog 10¢. Mailway, 1224 Ninth Avenue, San Francisco, Calif. 94122.

U.S. Marines "Hand To Hand Combat" manual \$1.50. Catalog of manuals 25¢. Hillcrest Publications PM-8, McDonald, Ohio 44437.

FREE BOOK. Prophet Elijah Coming Before Christ. Megiddo Mission, Dept. 63, 481 Thurston Road, Rochester, N. Y. 14619.

NATIONAL Geographic Magazines. 1888-1971, any issue. Buxbaum, Box 465-PM, Wilmington, Delaware 19899.

FREE CATALOGS!! Directory Lists Hundreds. \$1.00. CATALOGS, Box 24PM, Staten Island, New York 10304.

FREE AMAZING CATALOG. Gifts And Novelties. Fred Wise Company, 1381 South Hermosa Ave., Banning, Calif. 92220.

INTERNATIONAL Bookfinding. You Name It, We Find It. Search Service, Squaw Rock, Danielson, Conn. 06239.

FREE List, Books, all Types, low cost. Daco Enterprises, 3415 West 62nd, Street, Cleveland, Ohio 44102.

SENSATIONAL Finds! Bargain fiction, how-to, educational books. Free lists! Lloyd, 195 Wilkins, Rochester, N.Y. 14621.

HIGHER INCOME SECURITY And POWER—256 Page Book—THINKING BIG Reveals Secrets "That Make Men Rich". SEND \$2.00. B & M SALES CO., 300 S. MAIN, MORTON, ILL. 61550.

HOW TO GET Success, Wealth, Happiness, Health. How to solve Personal Problems. FREE list low cost books. Olive, 1739 Lasenda, South Pasadena, California 91030.

USED BOOKS FREE LIST SPECIFY INTERESTS. ROBERT SHUHL, BANTAM, CONN. 06750.

MORTGAGE GUIDE—FHA And Conventional loan interest tables 6% through 10%—Monthly payments including interest necessary to amortize loans. \$2.95. Company Store, 2101 N.E. Flanders, Portland, Oregon 97232.

IMPROVE Your Personality! 110 Page Book—"Dynamic Thinking" Shows How. Send \$1.00. Bis-Sell's, 1100 E9th Kansas City, Missouri 64106.

BOOKS! Low Cost! Exciting! Unusual! List Free. Sandee Specialty, Box 1656, Klamath Falls, Oregon 97601.

LEARN Why and how and a few important don'ts of massage. New illustrated booklet \$1.00. Webbco #3H, 846 East 4th St., Ontario, Calif. 91764.

PLAYS, SONGS, MANUSCRIPTS

POEMS And lyrics of religious, reverent, inspired nature wanted for immediate recording. We are only interested in songs of hope, God's love, the comfort of His words and wisdom. Cathedral Recording, P.O. Box 78-PM, North Weymouth, Mass. 02191.

POEMS Accepted For New Songs Recorded Without Charge. Songs/Poems Examined Free. Tin Pan Alley, Box 11647, Sarasota, Florida 33578.

GOOD Songs wanted for early release on established label. Royalty contracts secured. Mountain Records. P.O. Box 19337, Denver, Colorado 80219.

BUSINESS SERVICES

PROFITS FROM CLASSIFIED ADVERTISING! Booklet shows you how to start your own business with Classified Advertising. Only \$1.00 (Refundable with first order.) C. A. MARTIN, POPULAR MECHANICS, DEPT. PMP, 224 WEST 57 STREET, NEW YORK, N.Y. 10019.

BUSINESS OPPORTUNITIES

IMPORT-EXPORT Opportunity, profitable world-wide, mail order business from home, without capital or travel abroad. We ship plan for no risk examination. Experience unnecessary. Free details. Mellinger, Dept. F2708, Woodland Hills, California 91364.

BECOME Tax consultant. Our students earn \$1,000-\$3,000 every tax season preparing returns evenings. State approved. National Tax School, Monsey 2BD, New York 10952.

EARN Money raising fishworms for us! Write: Oakhaven-38, Cedar Hill, Texas 75104.

MONEY Available Now! Both Business, Personal Uses . . . \$500 to Millions. Finance Anything . . . Get Rich Techniques . . . Thousands Sources. Free Details. AIDS, Box 725-A, Holland, Michigan 49423.

FURNITURE Refinishers, Furniture Sprayers! If your work, or your hobby, or your interests are refinishing furniture, you can earn \$100.00 or more in two hours per evening, three or four evenings per week. I am doing it now. Proven and Tested, no investment. Details \$1.00. Louis Bolnik, 373 W. Susquehanna St., Allentown, Pa. 18103.

FREE Millionaire Book. Get hundreds of successful, little one-man businesses. Work home. SBI-7, Kerrville, Texas 78028.

IMPORTS! Your open door to FORTUNE. Exciting Informative Directory \$1.00. Hurry! Olympic Products, 152 West 42 Street, Dept. 536, New York, N.Y. 10036.

311 FAST, Easy ways to make money! Free! Rush name, address, zip. Perry, 13263 F Ventura Blvd., Studio City, Calif. 91604.

MAKE \$1,000 A MONTH OR MORE IN MAIL ORDER Using my plan. Details free. Beacon House, 1406B Beacon Street, Cincinnati, Ohio 45230.

EARN Thousands at home. How to sell books by mail. Free details. Wisdom House, Box 1106P, Largo, Florida 33540.

FORTUNES In HERBALISM! \$10,000+ Possible in small yard. Learn complete business know-how. \$1.98. Herbalism Institute-B, 1339 Remuda, Glendora, California 91740.

UNIQUE Financial Club, Private. Returns \$80.00 Profit For Every Dollar Invested. Copyrighted Program. Newsletter, Instructions, Enrollment Form—\$2.00. Price Distributors, 1623 Sherwood, Anderson, Indiana 46012.

HOME BUSINESS—Exciting Opportunity Details Free. Continental Associates, P.O. Box J382, Lake Katrine, N.Y. 12449.

BIG PROFITS YOURS From Commission Mailings. Everything Furnished. Learn how! Write: Slater, 217B Pearl, Redondo Beach, Cal. 90277.

\$300 Up part time, house, computerized Bookkeeping. We teach, age no barrier. Experience unnecessary. Calektronik, 5606 Paramount Blvd. Department 1032, Long Beach, Cal. 90805.

OPPORTUNITY Knocks Only Once—Invite It!!! Free Information For Stamp. TBOR, Box 1692-D, F.D.R. Station, New York 10022.

\$128.00 IN Sales from \$12.00 material. New, Different, everything furnished. Details 25¢. Newton, Box 08036, Detroit, Michigan 48208.

MAIL Catalogs Your Name on them. Indian Items Dropshipped. Kit 10 Catalogs \$1.00. Cherokee Joe, Rte. 1-B, Dawsonville, Ga. 30534.

\$100.00 WEEKLY Possible! Home Business. Free information. Amrose, Box 8282-C, Richmond, Va. 23226.

BECOME "Mortgage Broker." Lucrative! Capital Sources, Box 99-A, Uleta, Florida 33164.

SELL Guatemalan typical items.—Ask airmail free catalog.—Mapilon, Box 268, —Guatemala, Central America.

50% RETURN On Safe Investment. Financial Insiders Make Millions. Success Clinic, P. O. Box 334P, Quincy, Mass. 02169.

EARN \$200.00 A day, Easy, I have. For Details Send \$4.00. Phil, Box 369, Hales Corners, Wisc. 53130.

INSTALL Burglar Alarm Systems. Big profit home business. Beginners start spare time, without mechanical experience or costly equipment. Free starter plan. Nasco, Dept. F2708, Woodland Hills, California 91364.

BIG Profits In becoming a supplier to major industry through electroplating small parts and metalizing non-metals. Write for free particulars: Mason, Room MC-2-BK, 1512 Jarvis, Chicago, Ill. 60626.

RACING Editor, 45 years racetrack experience, reveals first time "My Four Winning Systems." Kearney-FH, 30 East 42nd, New York 10017.

15,000-WORD Encyclopedic manual about mailorder, plus custom answers bonus, only \$3.00. Free details. Dynamic Sounds, 1404 Grant, Denver, Colorado 80203.

1000% Profit Bronzing Baby Shoes. Free Literature. NBC, Box C-4-PM, Coral Springs, Florida 33065.

HOW And where to get capital. \$5000+ possible in one day. Free details. James Peter, Box 571-AM, Westwood, N.J. 07675.

FREE 1972 100-Page Catalog waiting to bring you Big spare-time cash commissions. Sell Advertising Book Matches. Every business a prospect . . . complete selling instructions furnished. Steady, repeat business. Dept. MX-872, Superior Match Company, 7530 South Greenwood, Chicago, Illinois 60619.

MAILORDER Millionaire helps beginners make \$500 weekly. Free report reveals secret plan! Executive (1A8), 333 North Michigan, Chicago 60601.

GUARANTEED BIG PROFITS. Famous hair trimmer 14¢. Wrist watches under \$5.00. Send \$1.00 for information and sample. K.O. Enterprises, P.O. Box 1072-B, Bellflower, California 90706.

MAILERS Needed! Big money! Send 10¢ for information. Andrew Sales, Box 152, Blue Island, Ill. 60406.

MAKE Magnetic signs, Machineless method. Profits enormous. Write: R1B49APM, Bardstown, Ky. 40004.

MAKE A Years Income in 8 weeks Camping. No selling. Capital or Land necessary. Write: Edru's, Route 5, Box 5733, Gig Harbor, Washington 98335.

(Continued on next page)

BUSINESS OPPORTUNITIES

(Continued from preceding page)

HOLLYWOOD CEMENTCRAFT: Offers Highly Profitable Home Business. Experience Unnecessary. Unlimited Unique Pottery Designs Easily Made Without Moulds. Bird-baths, Fountains, Wishing-Well, Waterfalls, etc. Chemical Coloring Formulas. Marble-glazing. FREE Illustrated Brochure. **CONCRETE FACTS**, 602 Athens Street, Altadena, California 91001.

PIANO Tuning Learned Quickly At Home! Tremendous field! Musical knowledge unnecessary. GI approved. Information free. Empire School, Box 327, Miami, Florida 33145.

WORLD'S Largest supply, Merchandise 25% to 40% under wholesale. Bankrupts. Closeouts 10¢ on dollar. Imports. Hong-Kong clothes. Automobile discounts. Free details. International Buyers, Box 16386 MM, Portland, Oregon 97233.

ADVERTISING BUSINESS—YOU Own it. \$350 First Week or Money Back. Electric Neon Action Ad Clock, 229 W. Illinois, Chicago 60610.

SELL Lifetime, Metal, Social Security Plates, Big Profits! Sample and Sales Kit Free. Russell, Box 286-PM, Pulaski, Tennessee 38478.

COPUBLISH "Mail Sale Advertiser," leading mailorder paper. Copy and details 25¢. U.S.A. only. Vanroy Shirk, Lebanon, Pa. 17042.

DRAFTSMEN! Operate own DRAFTING SERVICE! Full, Part Time; Experience unnecessary; Details: Roberts Drafting, 1741 Circle Road, Baltimore, Maryland 21204.

FREE Catalogs. Repair air conditioning refrigeration. Tools, supplies, full instructions. Doolin, 2016 Canton, Dallas, Texas 75201.

I MADE \$40,000.00 Year by Mailorder! Helped others make money! Start with \$10.00—Free Proof. Torrey, Box 318-Y, Ypsilanti, Michigan 48197.

VENDING Machine big catalog. Rake, 523 A Spring Garden, Philadelphia, Pa. 19123.

MAIL Baby Catalogs Imprinted with your address to New Mothers for Big Profits! Details 25¢. Volz PM, Ypsilanti, Michigan 48197.

MAKE Money from old tires. Operators clearing \$800, weekly. Equipment costs \$1500. Get facts. S & S Patents, Inc., 3752 N. Damen, Chicago 60618.

MAKE \$46 From square foot plywood: jigsaw or bandsaw necessary. Free details. Woodar, Bridgewater, Mass. 02324.

SUPERIOR Auction School. Nation's top Auctioneers own and instruct. Box 1281, Decatur, Ill. 62525.

\$200.00 SPARE Time earnings with your Tablesaw. Write: Workshop Five, 3800 Harney, Vancouver, Washington 98660.

\$25.00 HUNDRED Addressing. Possible Year 'round. Complete instructions 25¢ for registration, postage. Cove, Box 1348-B, Clearwater, Florida 33517.

\$70 TO \$200 WEEKLY—Home, Spare Time Simplified Mail Bookkeeping. Immediate Income. Easy. Auditax, Box 34741A, Los Angeles, Calif. 90034.

VENDING Machines. No selling. Routes earn amazing profits. Big catalogue Free. Parkway Corporation, 715PBM Ensor Street, Baltimore, Maryland 21202.

\$60.00 DAY. Manufacturing Concrete Posts. Blocks. Mold Equipment Catalog \$1.00 refundable. Carlayne, Route One, Box 95, Rapid City, South Dakota 57701.

MAIL Order Collection Agency can make you \$1000.00 monthly. Free Details. Continental, Box 2023-A, Des Moines, Iowa 50310.

ADDRESSERS And Mailers Needed. Details 10¢. Lindbloom, 3636 West Peterson, Chicago 60659.

SELL Books by mail. 400% profit. Royal, Box 450-X, Cleveland, Ohio 44127.

WATCHMAKING Makes every day a payday. Learn this cash business at home. Free details. Sweazey, YHA, Fox River Grove, Illinois 60021.

MAILORDER Book Publisher Wants Dealers. Details 25¢ (refund). Jan Enterprises, 76P, Wild Rose, Wisconsin 54984.

HOMEWORKERS. \$100.00 Weekly Addressing for firms. Begin immediately. Details—send stamped, addressed envelope. Hamilton, 272-TMA-8, Brooklyn 11235.

EARN \$40.00 DAILY. Manufacture Concrete Bricks. Very Small Investment. Send Stamp. Free Details-Hilmar, Rt. One, Box 347-D, Valrico, Florida, 33594.

CLIP Short newspaper items. To \$10.00 each. Details free. Foster, 272-M-8, Brooklyn 11235.

900% PROFIT For Men And Women with your own Magnetic Sign Shop! Big demand for 3-D magnetic signs on cars and trucks. Start in garage. Kitchen or camper. Spare or full time. Financing available. Write today for free details. Nationwide Plastics, Dept. 257, 4200 Panamint, Los Angeles, Calif. 90065.

\$2000.00 MONTHLY POSSIBLE. Details. Write: Walker, 1510 Meridel, Tampa, Fla. 33612.

SELL Beautifully Colored Social Security Plates. Big Profits! Free Samples! Paul Wright, 1075 Ringwood Avenue, Pompton Lakes, N. J. 07442.

\$200.00 DAILY In your mailbox! Your opportunity to do what mailorder experts do. Free details. Associates, Box 136-A, Holland, Michigan 49423.

MEN-Women Make Big Profits At Home! In Plastics, part or full time! Unique process teaches you with equipment we give you free to make hundreds of 3-D plastic products, candy and candle molds, plaques, signs. Skin and bubble package. Also resin casting. Write today for free details. Nationwide Plastics, Dept. ARX, 4140 Eagle Rock Blvd., Los Angeles, Calif. 90065.

MAILORDER Records help get increased business! Complete 32 page Record Book shows your inquiries, orders, advertising, expense etc. Only \$1.00. C. A. MARTIN, POPULAR MECHANICS, DEPT. PMR, 224 WEST 57TH STREET, NEW YORK, NEW YORK 10019.

COMPLETE Mail Order Business For Sale. Free Details. A M Sales, 32-28 100 Street, East Elmhurst, N.Y. 11369.

BIG Profits!! Mail Baby Gift Catalogs. Tremendous, Continuous Market! Complete Money-making Details; Write: Carl Lass Co., Box 1416, Chicago, Illinois 60690.

"GUARANTEED \$25,000 1st year mail order earnings. Free details. Glenwood, 4721C Indiana, Salem, Oregon 97303."

MEN—Women Needed Now to fill out income tax forms at home. We show you how. Simple, easy to learn. \$700 per month earnings possible. Details mailed free. No salesmen. Hurry. Federated Tax Service, 2065 Montrose, Chicago 60618.

\$1000 Day-150% Profit. Selling by mail. No investment in inventory. Part time—full time. Unlimited potential. Complete details \$1.00. National, Box 7212ZAG, Chicago, Illinois 60680.

MEN—Women! Start money-making Plastic Laminating business at home in spare time. Material costing 11¢ brings back \$2.58. No canvassing or selling but mail orders bring in \$20 a day. Write for full particulars free. Rush name on postcard to: Warner, Room LC-2-BK, 1512 Jarvis, Chicago, Ill. 60626.

TAKE Catalog orders. We drop-ship 1001 best selling specialty products. Guaranteed lowest below wholesale prices. Fantastic spare-full time home business. Free book show you how. SMC, 6061 SPH De Soto Avenue, Woodland Hills, California 91364.

BUILD Custom Cases at home for profit. Get orders by mail. We supply materials, instruction—everything. Free home business details. Custom Case Supply Co., 6075 CPH De Soto Avenue, Woodland Hills, California 91364.

I'VE Got the horseraces beat! Proved over four years. Will reveal. Strauss-FH, Brooklyn, New York 11219.

1100% PROFIT, Bronzing or Pearl Finishing Anything. Free Proof! Kiktavi, Box 2127D, Inglewood, Calif. 90305.

MAILORDER Money-making Kit. Home Business. Valuable lists, concrete information, detailed steps. Capital unnecessary. Free Details, Pictures. Meadows, Box 327-PM8, Boston 02199.

REPAIR Hydraulic Jacks—Details Free. Write: Hydraulic Parts Supply, Box 295, Port Isabel, Texas 78578.

MAIL Letters Featuring Real Merchandise! Get \$12.00 orders every mail, \$8.00 profit. Everything furnished. Free details; write: Stayer Enterprises, 3704 Warwick, Peoria, Illinois 61614.

SECURE YOUR FUTURE By Owning Your Own Vending Machine Business. First Book—"How To Do It From Start To Finish". Proven Methods. Send \$5.00—Robot Inns, Box 456, Agnew Station, Santa Clara, California 95054.

\$15,000-\$30,000 Year. Send \$2.00 BOOK "Raising Rabbits for Us". Rabbit Ranchers of America, Box 265-X, Haysville, Kansas 67060.

EARN \$60.00 Daily manufacturing Concrete Fence Posts. Practically no investment. Send stamped-addressed envelope. American, Excelsior Springs, Mo. 64024.

RECEIVE MAIL Galore! Your name on our national mailing lists, 50¢. Sullins, Box 1313, Brunswick, Georgia 31520.

FABULOUS SECOND INCOME. Deal in gold. New manual shows how. Information, write, Research, Box 804, Hammond, Ind. 46325.

165 FREE Wholesale Catalogs! Mailorder Dropshippers. Your Business Imprint. Automobile Discounts. Free "Digest." Vault International, Box 7284W, Lexington, Kentucky 40502.

GUARANTEED INCOME!!! Home Mail-order Business can make you rich! Everything furnished—even national advertising. Details \$1.00. Galaxy (2P8), 15307 Nevada Street, Woodbridge, Virginia 22191.

PROFITABLE BUSINESS—Molding Rubber, Hobby Supplies. Details 10¢. Chaney's, 5415 L San Jose Blvd., Jacksonville, Fla. 32207.

MAKE Money 2 to 3 times your cost. \$2.00 Bring giant below wholesale catalog. Refundable on first order. Birkemark Co., 14362 Bushard, A140, Westminster Calif. 92683.

FREE BOOK "999 Successful, Little-known Businesses." Work Home! Plymouth-ADH, Brooklyn, New York 11218.

MAILORDER! How to prepare your own catalog for pennies! Free catalog! Obie-ADG, Brooklyn, New York 11219.

FREE BOOK "How To Fail or Succeed in Mailorder!" Plymouth, MM0H, Box 111, Brooklyn, N.Y. 11223.

400,000 BARGAINS Below wholesale! Many free. Liquidations . . . closeouts . . . job lots . . . single samples. Free details. Bargainhunters Opportunities, Box 730A, Holland, Michigan 49423.

YOUR Own Social Security Plate Business—\$24.95! (Machine Included.) Free Details. Idea Products, Box 69828PH, Los Angeles 90069.

CALIFORNIA MANUFACTURER NEEDS Man to assemble our product and be local agent, experience unnecessary. May start while presently employed. Five-figure income for responsible applicant. S.K.R.M. Manufacturers, 2347 West 238 Street, Torrance, California 90501.

(Continued on next page)

BUSINESS OPPORTUNITIES

(Continued from preceding page)

MAILORDER—Profitable products, drop-shipped. No merchandise investment. Everything supplied—catalogs, ads, mailing lists. Gif-Guide, 1137½ Crenshaw, Dept. 283, Los Angeles 90019.

\$75 DAILY Working only 5 minutes a day. Guaranteed. Professional Method. Details Free. NeWorld, Box 1446, Lafayette, Indiana 47901.

STARTING And Succeeding in mail order Details Free. Robert Coombs, 24 Sherwood Ave, Franklin Square N.Y. 11010.

HOW To make money in mail order imports. Booklet MO 521 \$1.00. Russell Enterprises, 5336 Denny Drive, College Park, Georgia 30349.

\$400.00 MONTHLY Raising giant fishworms. Soilless method. Charlie Morgan, Bushnell, Florida 33513.

FREE Money Secrets. Get Plan For \$500 to \$2 Million. Business capital, loans, cash. Free details. Capital-17, Kerrville, Texas 78028.

UP Your OWN Organization! A complete guide on how to start and finance your own business. Free brochure. Entrepreneur Press, Dept. A-88, Drawer 2759, Santa Clara, Calif. 95051.

MAKE \$1,000,000.00 In 10 years, Free information, House of Hoke, Department 101-PM, Sebring, Florida 33870.

MAILORDER! MAIL Your Own IMPRINTED BABY CATALOGS To New MOTHERS. Sample CATALOG, Details 20c. RUS-MAR SALES, P.O. BOX 1113, THOMASVILLE, NORTH CAROLINA 27360.

FREE Catalog. 1001 Best Mail Order Specialties and Gifts. Buy Below Wholesale. Telesis, 71 Carter Lane, Winslow, Ark.-72959.

SELL BOOKS!! Complete Mailorder Plan. Vikari's, Box 1312PM2, Salt Lake City, Utah 84110.

\$35,000+ INCOME Selling mailorder cosmetics! New, fantastically successful plan! Only \$3. **GUARANTEED!** Offer limited! Order today! Exotica, Box 4294-C, NYC 10017.

"MAILORDER Course! Home Study," 24 Easy Lessons, \$2.00. "Bill" Lambertson, 132 Tamiami Station, Dept. PM82, Miami, Florida, 33144.

MAILORDER. Sell Books. Details, Sources \$3. Guaranteed. Nats, Rt1 Box 601, Gonzales, Louisiana 70737.

EXCLUSIVE. Territories available to become an independent wholesale distributor of costume jewelry. For details write: Lady Stephanie Ltd., 22 Sagamore Way No., Jericho, N.Y. 11753.

SECRETS! Mail Order Success. Internationally famous expert reveals how to make home business fortunes. Beginners: Get free copy "Make Money By Mail." Discloses free advertising, profitable products. Mailco, Dept. FC708, Woodland Hills, California 91364.

FREE Collection Agency Details!! \$1,000.00 Monthly Possible. Master-4, Drawer 77009, Atlanta, Georgia 30309.

PRIVATE POSTAL ROUTES New Delivery Service—Lifetime Opportunity. Details: Jobrine, Box 27, Great Neck, N.Y. 11023.

NOW! Make money on the booming baby market. Mail catalogs to new mothers with your name. Free Catalog! Vento, 1734-D-60th Street, Brooklyn, New York 11204.

EARN \$1000.00 Monthly furnishing stamps to collectors by mailorder!!! Free details. International, 6767MF South Atlanta, Tulsa 74136.

HOW To Raise \$100.00 To \$1,000,000.00!! Free Details. Drawer 77009-PM, Atlanta, Georgia 30309.

OPPORTUNITIES UNLIMITED! Spare-time Service Field. Free Details. Trend Craftsmen, 4901-PM Perrine, Midland, Michigan 48640.

MAKE Money at home! Free Booklet tells how. RAREMAILCO, Box 5899, Pittsburgh, Pa. 15209.

HIGH PRESSURE SPRAY BUSINESS, WASHING HOUSES, MOBILE HOMES, BARN PAINTING, INSECTICIDE, ETC. EXCELLENT INCOME. PIONEER, 416 S. CLARE AVE., HARRISON, MICHIGAN 48625.

MY NEW Business can easily make you \$1,500 per month. Galathea Enterprises, 923 Fruit Ave. N.W., Albuquerque, New Mexico 87102.

MAILORDER BEGINNERS: Avoid Costly Mistakes! Free Details! Jezuit, 116-AH Mooney, Olyphant, Penna. 18447.

FREE DETAILS EXPORT-IMPORT, profitable mail order business, work at home. Morgan-Weisel Company, 227 Hollis, Dept. P-82, Campbell, California 95008.

HOMEWORKERS—Mailers Wanted! Free Information. Allen, 2418-A Lori, Santa Ana, California 92706.

START Your own Direct Selling Business fast for only \$10 following my plan. Others do all selling. You fill Mail orders from home. Part-full time. Free Report. Morgan, Dept. F2708, 6100 Variel, Woodland Hills, Calif. 91364.

DISTINCTIVE Quality Gift Business. Locations limited. Information free, catalog 35c. LPI, PM8, 11611 Sharpcrest, Houston 77072.

FREE Sample. Sell Lifetime Social Security Plates. Big Profits! Ultis, 10716 Francis, 1PM, Los Angeles, California 90034.

MAKE MONEY Second Income Selling Your Photos Millions of Photos Color Slides Bought by Newspapers, Magazines. Booklet Includes Directory Where To Sell Your Pictures. Send \$1.00. Crescent House, Dept 8A, 152 West 42 Street, New York, N.Y. 10036.

NEW Mothers Buy On Sight. Big Profit, Details, Sample, 25c. Panmar, Box 115PM, Riverside, Conn. 06878.

MAKE Your Products details free. McDaniel, 17886 Jos Campau, Detroit, 12 Michigan.

WE NEED GINSENG GROWERS! \$3,000-\$30,000 Annually! We Buy Your Crop. Send \$2 for seed sample and information. Glass's Ginseng Exchange, Box 336, Rochdale Station, Jamaica, NY 11434.

HOW To Start RETAIL CLOTHING BUSINESS. \$2.00 or write: Bruce's Family Clothing, 897 E. Base Line, San Bernardino, California, 92410.

INSTANT MAILORDER BUSINESS! Everything supplied. Easy! 100% profits! Starting kit \$3.00 refundable. HARVI-HOUSE, PM-802, Box 22483, Denver, 80222.

\$2,000.00 WEEKLY Possible. Air Condition House Using Vacuum Cleaner. \$5 Refundable. Miracle Science, Box 282, Bonner, Kansas 66012.

\$20,000 YEAR (Easy)! Operate Computer Tax Service. Experience unnecessary. Details: Omar, Box 2702-A, Riverside, California 92506.

LEARN MAIL ORDER BUSINESS Write for free information. Horizon Enterprise, Dept. 200, 2300 S. 9th Street, Arlington, Va. 22204.

GROW GINSENG For Profit. Write for free growing information & seed prices. Pulvermacher's Produce, Dept. C., Richland Center, Wisconsin 53581.

\$1.00 LISTS You year sent to 1000 Importers, Jobbers, Mailers, our mailing year. Dixie, King, North Carolina 27021.

\$100.00 DAILY Selling magnetic signs! SPN, Box 15, Murray Hill, New Jersey 07974.

OPERATE Telephone Answering Service in your home. Increasing demand for this service! Manuscript explaining how to start \$1.00.—K. E. Nowell, Dept. PM-88, 1267 Vanderbilt, Ormond Beach, Florida 32074.

SPARETIME Mail-Order business. Make extra money. Experience not necessary. Literature free. Handi-Way, 9PM Kuiken Court, Wayne, New Jersey. 07470.

QUIT YOUR JOB!!! DOUBLE YOUR PAY-CHECK!!! \$200.00 to \$600.00 Weekly In Your Mailbox. Spare Time, Inexpensive Home Business. **FREE MONEYMAKING PLAN!** WHITE, 265 South Robertson, Beverly Hills, California 90211.

\$300.00 WEEKLY Possible with Camera. Everything explained. Photocolor Distributors, Box 273PM, Burlington, Vermont 05401.

UNIQUE New Business can easily earn you \$1,000 per month. Write: Mercantulsa, Drawer 4717, Tulsa, Oklahoma 74104.

\$400.00 WEEKLY MAILING BABY CATALOGS Imprinted with your address to New Mothers Everything furnished—Very Small Investment Details 25c. Tannenbaums-M, 6 Fiesta Court, Hewlett, New York 11557.

TRANSPARENCIES Wanted. Learn **FREE-LANCING.** American Color, Box 2193, Sepulveda, California 91343.

MONEYMAKING OPPORTUNITIES

SCIENTIFIC Messages: Big Earnings uncrowded profession. Learn spare time at home. Diploma awarded. Free catalog. Write: Anderson School, Dept. J-1C, Princeton, Illinois 61356.

SHARP \$\$\$ Opportunity! One low-cost machine sharpens, serrates, knives, scissors, pinking shears. Earn \$6-\$9 hourly in spare time. Professional results without experience. Free details. Beaver Grinder, 8P2 Nielsen Building, Eugene, Oregon 97402.

MONEYTREE Is \$500 In Your Pocket. Get gifts, money, aids, other free offers. Free details. Moneytree-6, Kerrville, Texas 78028.

MUSHROOM LOVERS—Like To Save Money—Read Miscellaneous Column Advertisement.

MAKE \$1.00 PER SALE Selling engraved metal Social Security plates. **FREE SALES KIT.** Engravaplates, Box 10460-199, Jacksonville, Florida 32207.

SELL Your Way to Financial Freedom. 448 Pages packed with secrets of success. Send \$1.25 plus 15c postage to: Books, Box 5836PMA, Concord, California 94520.

MAKE MONEY With your Camera. Over one million Photos and color slides bought each year. Booklet gives details. Only \$1.00. Booklet #MO-54PB. Kinco Enterprises, 6683 Gross Ave., Canoga Park, California 91304.

SELL Your Photos. Report Tells How, Where, Color Slide Markets. Only \$1.00. Lewis, Dept. P18, 20 Gay Street, Westwood, Mass. 02090.

FABULOUS Money-Making, Saving Opportunities, plus valuable formulas and ideas sold at \$10.00. Send only 25c. Prosperity, 962 Eva Ave., Akron, Ohio 44306.

BEGINNER'S Money-making Mailorder Kit \$1.00. May's, Box 802-H, Natchez, Mississippi 39120.

CONTEST REPORT Complete Information About Cash Prizes Offered Monthly. Send 25c for Current Issue, Box 307A, Ypsilanti, Michigan 48197.

BECOME PUBLISHER'S REPRESENTATIVE Salary, auto, expenses. Detailed treatise and contacts \$2.00. Rigby, 1044 P Yellowstone, Xenia, Ohio 45385.

"AMAZING"—Home Money-making Opportunities! Free Illustrated—Informative Brochure! Stamp Appreciated, Mann, 7-R-4, Wilste, Hillsdale, New Jersey 07642.

AMAZE Your friends. Electro-GOLD-Plate for fun and huge profits. Send for information or send \$9.85 for complete kit. Guaranteed. K.D. Enterprises, P.O. Box 1072-B, Bellflower, California 90706.

(Continued on next page)

MONEYMAKING OPPORTUNITIES

(Continued from preceding page)

WORLD'S Leading contest magazine, 25¢. Year, \$4.00. Prizewinner, 1315 Central, St. Petersburg, Fla. 33705.

FIX Typewriters from home. Repairs available. Easily learned. Athey, Tarentum, Pa. 15084.

SELL Sensational Car Thief Signal. Lightning Seller. Samples for trial. Northwest Electric, Ave. 862, Mitchell, S. Dak. 57301.

MONEY. Make Hundreds extra Spare-time home by mail. Opportunities, tips in magazine that tells how, leading mail-order magazine since 1929. Sample \$1. Year \$5 with free what is mailorder opportunities folio. Mail Trade, P.O. Box 1302, Springfield, Illinois 62705.

CLIP Newspaper Items. \$1.00-\$25.00 Each. Free Details. James, Box 124M, Inglewood, California 90306.

FREE—Easy Ways to make money selling exciting new products—Full—spare time. Send name, age, for 5 months free subscription. Salesman's Opportunity Magazine, 1460 Hancock Center, Dept. 17HM, Chicago 60611.

MAKE Statuettes, novelties, imitation marble. Sell to stores or start gift shop. Free details. Marbleizing, 41 Waverton, St. Louis, Mo. 63124.

HOMEWORKERS. Makes \$50 every 150 envelopes you mail. Rush 25¢. Gemco, B-21244A, Indianapolis 46221.

HOW TO GET RICH!! Free "Money-making Brochure"! Success International, Box 2447-C, Livonia, Mich. 48151.

\$200.00 FROM Sheet 1/4" plywood (scrap). Details 25¢. Novelties, 610 So. 24th, Elwood, Indiana 46036.

GET World's Biggest Wholesale Import Catalog. Write: World, Medina, Washington 98039.

VENDING Machines. No selling. Routes earn amazing profits. Big catalogue Free. Parkway Corporation, 715PMM Ensor Street, Baltimore, Maryland 21202.

HOW To Make Money Writing Short Paragraphs. Information Free. Barrett, Dept. C-27-K1, 6216 N. Clark, Chicago 60660.

CLIP Newspaper Items. \$1.00-\$5.00 each. Details free. Walter, Box 1360PA, Erie, Pa. 16512.

PENNY STOCKS Have Profit Potential. Free Information. Analyst-P.M., Box 214, Redondo Beach, California 90277.

BIG Money Writing Jokes. Enormous demand. We show you how. Free Facts. Laffs, Dept. G-98, Pleasant Hill, Ohio 45359.

MAKE Money!! Use "The Money Makers System". Free Details. Elwing, Box 1427, Fremont, Cal. 94538.

"HOW TO MAKE MONEY WRITING FILLS"—Articles And Short Paragraphs Tells What To Write And Where To Sell It. Directory Included. #MO-51F \$1.00. Southall Distributors, 638 Idlewild Circle, Apt. #7, Birmingham, Alabama 35205.

DO YOU WANT TO MAKE MONEY! Sell Perma-Cards. Write Lifetime Plate Distributors, Dept. 707, Grovetown, Ga. 30813. Free Sample & Sales Kit.

BECOME Notary Public! Have dignified sideline. Free Details. Stationers Exchange, Box 617, Kilgore, Texas 75662.

COMPLETE All Time Winning Horse Racing System Yours For 25¢ Handling. Allan Weiser, 160 Broadway, Suite 1102, New York, New York 10038.

"FREE!" Catalog Listing low cost books on money making opportunities and self improvement. Sleigh Studios, 5235 Castor Avenue, Philadelphia, Pa. 19124.

ADDRESSERS And mailers needed. Details 10¢. Slack's, Box 375, Toronto 19, Ontario.

MAKE \$1,000 Per month from your own home, write, Genz Enterprises, 153 Kingsboro Avenue, Gloversville, New York, 12078.

WHOLESALE FAMOUS HOME STUDY COURSES! By Mail. No Course Investment. Start with \$12.00! Free Details! Study Promotions, R7, Rome, Georgia 30161.

EARN Money at home mailing letters. Everything furnished! Send stamped envelope. Arrow Products, Box 374-P, Broken Arrow, Okla. 74012.

OWN YOUR OWN COSMETICS BUSINESS. Make cosmetics for pennies in your own kitchen. Put your own brand name on the label and sell to friends and relatives. We send you formulas for shampoo, cold cream, hand lotion, shaving cream, and much more. You also receive label ideas and information on jars, squeeze bottles, etc. Get in on the high profit cosmetics business by sending \$1.00 and a stamped self addressed envelope to: Cosmetics, P.O. Box 4326, Flint, Michigan 48504.

THE SECRET of Beating horse races. Exciting details free. National, Box 210, Griffith, Indiana 46319.

MAKE Money At Home... mailing circulars. Details free. Smith Mailers, Box 2469-PM, Newark, New Jersey 07114.

MAILORDER. Profits and pitfalls. Available for \$1 from: Adscos Business Services, 4907 56th, Lubbock, Texas 79414.

"609 UNUSUAL BUSINESSES." Excellent Opportunity Book (Guaranteed) Offers Free Consultation! Details, Premier Enterprises, PostBox 10597-H, Pittsburgh, Pa. 15235.

CONTESTS, Puzzles, Prize\$! Sample 50¢. Leisure, Box 191-PO, Brooklyn 11223.

FINANCIAL Independence can be yours. Join A.T.A. Write: American Taxpayers Association, 37 Limerick Road, Royersford, Pa. 19468.

MAKE Huge Profit Selling Colorful Social Security Cards. Send For Free Sales Kit. Superior Engraving, Box 321, Georgetown, Kentucky 40324.

TREMENDOUS Earning potential. Three unique businesses operated from home. Jeboco, Box 6542MH, Surfside, Fla. 33154.

NEVER Won Anything? Win Sweepstakes Contests! Find out how. Services, Box 644-PC8, Des Moines, Iowa 50303.

TAKING PICTURES THIS SUMMER?? Turn them into CASH!! Detailed report tells how. \$1.00. Delphi-1C8, Box 31072, San Francisco, California 94131.

200% PROFIT Selling Rings. Triple Money in 30 Days or Money Back. Free Details. Anka, P.O. Box 8036-PM, Cranston, Rhode Island 02920.

\$MONEY\$ MAKER! Engraved metal Social Security Plates. Free Sample. Beaver, 200 Polo Rd., Winston-Salem, N.C. 27105.

MAKE Money with "Instant Art"! Fantastic details: Jiffy Portrait, 1315 Ronan, Wilmington, Calif. 90744.

HAVE You Heard or Read About The "Bargain Buyer's Guide"? Details: Mercantulsa, Drawer 4717-B, Tulsa, Oklahoma 74104.

\$125.00 WEEKLY Correcting pupils' lessons! Samples, \$1.00! Welch's, 805 1/2 S Third, Marshalltown, Iowa 50158. Stentebeck's, 4211 North, Cincinnati 45236. Desberg's, 1818 Ocean Avenue, Brooklyn 11230. Goldie's, 2315N Bigelow, Peoria 61604. Helton's, 44 Martin, Montgomery 36110.

WE NEED AKC PUPPIES! BUY Puppies for us in your area. Make \$50 to \$250 per week. No cash or experience necessary. Write for free details. AKC Dogs, Box 211, Orchard Lake, Michigan 48033.

PROFITABLE OCCUPATIONS

RAISE Hybrid Redworms 2500 \$12.00—5,000 \$20.00 Postpaid With Raising Instructions. Angora Rabbitry, Quebec, Tenn. 38579.

LEARN GUN REPAIR GUNSMITHING in spare time. Book, details 10¢. Modern Gun Repair School, Dept. 1708, 4225 N. Brown, Scottsdale, Arizona 85251.

BECOME A Mortgage Broker. Highly respected, interesting, lucrative prestige business. For complete information write: United, Box 6284-F, Marietta, Georgia 30060.

HOW To Make Money Writing Short Paragraphs. Information Free. Barrett, Dept. C-27-K2, 6216 N. Clark, Chicago 60660.

MAKE \$300 CLEAR MONTH Few hours from 10 customers, representing us in your community. No individual selling. Repeats forever. Customers waiting, \$1 for sample, details. Our 40th year. Progressive, Box 1302, Springfield, Illinois 62705.

SHARPEN Scissors, Pinkers. Inexpensive equipment, tools, supplies. Blackhawk's, Sheldahl, Iowa 50243.

FT. SMITH Auction School. Ft. Smith, Ark. 72901. Residents & Home study. Veteran approved.

500 FIBERGLASS Molds for Casting Ornamental Concrete Products. Catalog \$1.00. Plycrete Mold Co., Elk Rapids, Michigan 49629.

EARN AS YOU LEARN. Part-time subscription representatives for leading magazines earn generous commissions while developing skills of salesmanship. For full detail, send this ad with your name and address to: **POPULAR MECHANICS**, Room 1107M, 250 W. 55th St., New York, N.Y. 10019.

CLOCK Fixing Simplified. Instructions, Tools. Free Details. Thiese, Genoa, Illinois 60135.

SALESMEN-DISTRIBUTORS

MAKE Extra \$25 to \$75 spare time! Double air cushion shoes. Men's, women's line. Dress, work, play. Highest commission. Shoes for yourself. Outfit Free. Bronson, Dept. H-82, Minneapolis, Minnesota 55408.

EARN Big money calling on business-professional men. Send us their delinquent accounts for collection. General Finance, Dept. PM-11, Columbia Bank Bldg., Kansas City, Missouri 64106.

BIG Steady Income! Leader in business printing/ advertising specialties will start you in business. No experience. No stock investment. Full, part time. Everything furnished. Write: Kaeser, Dept. B1008, 953 Martin Place, Cincinnati, Ohio 45202.

INGENIOUS Mechanics Tool Costs 40¢—Sells \$2.00 Sample \$1.50 (50¢ Postage). Speedline, B458, Woodriver, Ill. 62095.

BIG Earnings selling Hertel Bibles. New 3-dimension cover, finest reference edition sells fast. Demonstrator furnished. Big commissions. International Book, Dept. PM, Box 118, Wichita, Kansas 67201.

"WANTED". Man contact service stations. Long Needed Invention. Huge Profits. Write: Cyclo, 3816 Dahlia, Dept. 188, Denver, Colo.

EARN Big Commission Full or Part Time. Show America's largest line Low Priced Business Printing and Advertising Specialties Plus Calendars in season. No experience. No investment. No collections or Deliveries. On-the-spot commissions. Big Free Sales Kit samples hundreds items used daily by businessmen. Merchandise bonuses for you. Build profitable repeat business. Start now. National Press, Dept. 72D, North Chicago, Ill. 60064.

SELL Advertising Ball Pens, Calendars, Ad-Specialties—Build Own Repeat Business—Free Details—Fleming, Dept. A, 6535 Cottage Grove, Chicago 60637.

SELL Chain Lock Burglar Alarm for \$3.98 Buy Direct from Importer \$22.00 Dozen Sample Details \$3.00. Nardel, 8 Hartford, Natick, Mass. 01760.

(Continued on next page)

SALESMEN-DISTRIBUTORS

(Continued from preceding page)

CRIME Personal Protection Devices. Mass Demands, Tremendous Profits. Sheriff, Box 113, Twinsburg, Ohio 44087.

SELL Stores Profitable Items. Kitco, 808 Broadway, Kansas City, Missouri 64105.

BECOME A Successful Manufacturers' Representative. Manufacturers' Agents Newsletter tells you which firms are looking for representatives, the firms products line and territories available. For information write: Manufacturers' Agents' Newsletter, Dept. 152A, 23573 Prospect Ave., Farmington, Michigan 48024.

DISTRIBUTORSHIP Free! Big earnings distributing health products. Distributor's kit \$2.00 (refundable). Box 332-PM8, Devon, Pennsylvania 19333.

AGENTS WANTED

WILL You test new items in your home? Surprisingly big pay. Latest conveniences for home, car. Send no money, just your name. Kristee 133, Akron, Ohio 44308

WANT TO MAKE UP TO \$100 A WEEK Spare time, and get free shoes for life, too? No investment. Rush card for free details. Mason Shoes, K-911, Chippewa Falls, Wisconsin 54729.

SELL Office Supplies—Machines—Furniture—Equipment. Oseco, 3505-PM Elston, Chicago 60618.

EVERY Man a prospect. Refundable sales kit offer showing line belt buckles, tie clasps, money clips, cuff links, lapels, identification badges, individualized with customer's name and emblems. Cap badges for trucking, bus, taxi, police, firemen, also postal, letter carriers and heavy construction emblems. Choice 4000 emblems. Hook-Fast, Box 1088-PM, Providence, R.I. 02901.

YOUR Own business—Used Suits \$1.50; Overcoats 65¢; Mackinaws 35¢; Shoes 12½¢; Ladies' Coats 30¢; Dresses 15¢. Enormous profits. Catalog Free. Nathan Portnoy Assoc., 2109-AA Roosevelt Road, Chicago, Illinois 60608.

PRINTING, Advertising Salesmen—Excellent money-making sideline selling Decalcomania Name Plates, small quantities. Advertising Specialties, sign letters. Free Samples. Raico XL, Boston, Mass. 02119.

LIFETIME Income. Be our loan representative. Free Copy "Financial Freedom". Send \$1.00 refundable. Financial, Suite 1204-X3, 28 E. Jackson, Chicago 60604.

SELL Unique Prison Reform Booklet. Free Sample. Dal, 31 Ramsdell, Boston 02131.

ESTABLISH Your own business. Low prices on used clothing, shoes, household goods. Unlimited profits. Free catalog. Northwestern Distributors, 2129 No. Western Avenue, Chicago, Illinois 60647.

NEW Patented Product Need Agents. Details 50¢. Insharp Corporation, Box 321, Sanborn, New York 14132.

PROFIT \$1.25, Every \$2.00, selling convincing crime protection. Details 25¢. BHL-GPM, Box 2021, San Diego, 92112.

CHRISTMAS CARDS—For use by families, individuals and business firms. Personalized—your customer's name printed on the cards. Thousands have made extra money from Process cards during our 51 years in business. Lots of mechanically oriented hobbyists have used this money to help support their hobby. Many have been with us 10, 20 years or more. Beat inflation and earn unusually high commissions from this medium- and high-priced line. Customer satisfaction 100% guaranteed. No investment. No inventory. Free Sample Album. Best selling time starts right now. The Process Corporation, Dept. X226 3450 S. 54th Ave., Chicago, Ill. 60650.

EMPLOYMENT INFORMATION

OVERSEAS Job Placement Directory. Current Worldwide Openings. Moneyback Guarantee. \$3.00. Overseas, Box 29902-A, Los Angeles 90029.

AUSTRALIA Needs You. Complete Information and Employers List For 72 \$1.00. Miles, Box 62, New Prague, Minn. 55352.

AUSTRALIA EMPLOYING Now. Assisted Passage. High Salaries, 43 Job Addresses. Complete Guide, VanRiper, Box 220T, Afton, Va. 22920.

ANNOUNCER/DISC JOCKEY TRAINEES NEEDED NATIONWIDE. Payroll Training Status. Break into Broadcasting Regardless of Age or Educational Background. Free Details. Write: Program Director, 431 E. Nelson, Cadillac, Michigan 49601.

BRITISH COLUMBIA Employment and immigration information. Complete details, \$3.00. Doyle Associates, Box 2702, Williams Lake, B. C. Canada.

AUSTRALIA WANTS YOU!!! New Complete Details, Employer's List, Immigration Information. Satisfaction Guaranteed! Send \$2.00. Ventures, Box 832-M7, Kingsport, Tennessee 37662.

AUSTRALIA!! AUSTRALIA!! FREE DETAILS!! Government Paid Transportation. Latest Handbook and Forms. Write: Associated, Box 17B129, Lafayette, California 94549.

CANADA Fantastic Employment Opportunities! 1972 Report plus Employers Directory \$2.00. Canadian Information Service, Box 4045 Station A, Toronto 1, Canada.

AUSTRALIA WANTS YOU!!! Free Passage. 50,000 Jobs—Most Comprehensive Information Anywhere—Employment Directory, Business Directory, Teaching Opportunities, Education, Housing, Taxation, Ranching, Maps. Only \$1.00. AUSTCO, Box 3623-E, Long Beach, California 90803.

VIETNAM COMBAT VETS Adventure. Action, Fortune. Send \$3 to: CHALLENGE Inc., Box 2219, Lafayette, Indiana 47906.

HELP WANTED

OVERSEAS EMPLOYMENT . . . Australia, Europe, South America, Asia! All Occupations! \$700-\$3,000 monthly! Write: Employment International, Box 29217-AF, Indianapolis, Indiana 46229.

OVERSEAS Jobs—Europe, South America, Australia, Far East, etc. 2000 openings all trades. Construction, Office, Engineering Sales, etc. \$700 to \$3,000 month. Expenses paid. Free Information. Write: Overseas Jobs, International Airport, Box 536-M, Miami, Florida 33148.

"AUSTRALIAN OPPORTUNITIES KIT" . . . FREE DETAILS! Paid Transportation! Handbook, Special Reports, Forms! Australian Services, Box 29263-AH, Indianapolis, Indiana 46229.

FREE DETAILS . . . AUSTRALIA . . . Government assisted transportation. Latest Handbook and forms . . . Free Details . . . Write: Associated, Box 17-BA129, Lafayette, California 94549.

WORLD-WIDE . . . U.S.A. jobs Galore!! Students, all professions and occupations. Enjoy Paris, Rome, Tokyo, Mexico City, Miami, San Francisco. \$700.00 to \$3,000.00 monthly. Paid Overtime, Travel Allowance, Sightseeing. Free Details!! Write: Global Employment, Box 706-B129, Orinda, California 94563.

OVERSEAS Jobs—Australia, Europe, South America, Far East openings in all trades and professions. Free information. Write: Foreign Jobs Co., Box 2235 AMF, Miami, Florida 33159.

REAL ESTATE AND FARMS

CANADIAN LAND FROM \$19.00 AN ACRE CHOICE Properties available across Canada. Low monthly payments. Ideal for farming, cottages, hunting, fishing. Free Catalogue. Canadian Estate Land, Dept. PMC-8, 286 Lawrence Ave., West Toronto 20, Ont., Canada.

NEW! FREE CATALOG! Giant Fall-Holidays Edition! Over 5,100 New properties described, pictured—Land, Farms, Homes, Businesses—Recreation, Retirement. Selected Best thruout the U.S.! 72 Years' service—633 Offices, 41 States Coast to Coast. Mailed FREE from the World's Largest! STROUT REALTY, Inc., 60-MX E. 42nd St. NY, NY 10017; 7-MX S. Dearborn, Chicago, Ill. 60603; 521-MX E. Green, Pasadena, Cal. 91101.

PRESCOTT, Arizona. 2 Acres for finest country living. \$1,995. Low terms. Mrs. Anna Young, Glenarm Land Co., 2233 North 7th St., Phoenix, 85006.

OCALA FOREST CAMPSITES Deep in the heart of the Great Ocala National Forest. Excellent hunting and fishing. Free maps and photos. (Unavailable in States requiring separate registration). AD70LB710E, W. H. Vernor, Inc., P.O. Box 760, Dept. E, DeLand, Florida 32720.

FREE Catalog! PHOTOS! Coast to coast farms, business, retirement. All types, sizes & prices. SAFE-BUY Real Estate, Box 589-PM, Little Rock, Ark. 72203.

CANADIAN Vacation lands: Full price \$385.00. 40 acres. \$10 month. Suitable cottage sites, hunting, fishing, investment. Free information. Land Corporation, 3768-C Bathurst, Downsview, Ontario, Canada.

GOVERNMENT LANDS Low as \$3.50 acre. Millions Acres! For exclusive "Copyrighted Report". . . plus "Land Opportunity Digest" listing lands throughout U.S.; and VALUABLE 17 X 22 TREASURE MAP OF U.S.; send \$1.00. Land Disposal, Box 9091-PM, Washington, D.C. 20003. Satisfaction Guaranteed.

\$1 ACRE—Canadian border—hundreds campsites, islands, farmlands, directly from tax authorities. (Non-profit). Lists, photographs mailed. Register. Room 10, 110 Church Street, Toronto 1, Canada.

GOVERNMENT Lands . . . low as \$1.00 Acre! Millions Acres! For exclusive "Government Land Buyer's Guide" . . . plus "Land Opportunity Review" listing lands available throughout U.S., send \$1.00. Satisfaction Guaranteed! United Lands, Box 19107-AH, Washington, D.C. 20036.

CENTRAL Ontario—Choice 640 acre Sportsmen's paradises still available—\$20.00 plus \$6.50 taxes yearly. Maps, pictures. \$2.00 (Refundable). Information Bureau, Norval 4, Ontario, Canada.

HAWAII REAL ESTATE NEWSLETTER. Homes, condominiums, land, prices, rentals, economic summaries. 6 months \$5.00. Dorcliff, Inc., 736 South Street, Honolulu, Hawaii 96813.

BONDS. Buy on installments from "Selective List". Maximum safety. Earn higher interest. Free information. Insurance Premium Corp., 7771-A Bernard, Lasalle 660, Canada.

FREE . . . BIG 248-Page Catalog. Hundreds Of Top Real Estate Values Coast To Coast! UNITED FARM AGENCY, 612-PM West 47th St., Kansas City, Mo. 64112.

BOILING Spring Lakes—America's Greatest Real Estate Value. ½ acre vacation or retirement homesites only \$900 cash price. Ten-year terms available. Money-back inspection guarantee. Carolina coast, multi-million dollar, 14,000 acre development. 50 fresh water lakes, private ocean beach, golf course, motel, and country club. Free literature, Dept. 1-Y, Boiling Spring Lakes, North Carolina 28461. (Registered under Federal Land Sales act but not offered to residents of states requiring separate registration.)

IDEAL 5-ACRE RANCH, Lake Conchas, New Mexico. \$2,975. No Down, No Interest, \$25.00 Monthly. Vacation Paradise. Money Maker. Ranchos, Box 1095PM, Alameda, California 94501.

(Continued on next page)

DRINKING WATER-PURIFIERS

MONEY Saver! New Tapwater Purifier with Drinking Fountain. Fits any faucet. Equals bottled water. Kids delight. Gift-worthy. Guaranteed. Week trial free. \$5.99 Postpaid, refundable. Gilmoorhouse, Box 1175R, Denver, Colorado 80201.



FLOWERS, PLANTS & NURSERY SUPPLIES

LEARN Flower Arranging and Floristry. Start full or part time business or hobby. Free information on home study course. Lifetime Career Schools, Dept. B-460, 2251 Barry Avenue, Los Angeles, California 90064.

LEARN Landscaping and the growing of plants. Start a profitable business part or full time. Free information without obligation. Lifetime Career Schools, Dept. A-143, 2251 Barry Avenue, Los Angeles, California 90064.

AMAZING! (Rare) Flesh-Eating Venus' Fly Trap. Devours Insects! Complete Home Kit Grows Two Plants. \$1.50 Postpaid. Guaranteed. Full Instructions. Biodynamics, Box 6134-M, Salt Lake City, Utah 84106.

CONSTRUCTION PLANS, BLUEPRINTS

VACATION HOMES! Build your own. Plans with 160 page instruction book \$5.00. Free brochure. **HOMEBUILDERS**, 136-39 Scott, Dundee, Illinois 60118.

LOG CABINS & HOMES

"A" FRAME CABIN. \$500. For Material. Purchase Locally. Completely illustrated **INSTRUCTION MANUAL**, including material list: **\$2.00. MONEYBACK GUARANTEE.** Dependable, Plan #1910, Box 113, Vista, California 92083.

"BUILD Log Cabins, rustic furniture. fireplaces!!! Complete manual, \$3.00
"A" Frame plans. \$2.00 . . . Guaranteed
Beels, 956 Springdale, Atlanta, Georgia 30306."

HOME CRAFTSMEN

BEST WORKBENCH PLAN Ever. Plus Free Lumber Conversion Chart, \$1.00. **WAY-MAR**, Dept. 46, 58 Underhill Road, Scarsdale, New York 10583.

101 PATTERNS Of Smart Gifts, Novelties, Shelves, Action Windmills, plus "Make Money Jig Sawing". \$1.50. Mastercraft, 85M, 7041 Olcott, Chicago, 60631.

PICTURE Framing—Profitable full or spare-time business. Easy to learn with handbook-course "Guide To Picture Framing Profits." \$1.50 Guaranteed. Free framing-supplies catalog included. Japs, 126-PM Seventh North, Hopkins, Minnesota 55343.

PLANS Colonial Baby Cradle Gift or Toy \$1.50. Box 162B, R.D. #2, Quakertown, Pa. 18951.

WOODWORKING Catalog and Manual 50¢. Plus free "101 Project Ideas." World's most beautiful veneers, lumber, plywood! Wood finishing, upholstery supplies. Cane, Lamp Parts. Furniture hardware. Animal whittling blocks. 2,000 workshop products. Constantine, 2051-C Eastchester Road, Bronx 10461.

CABINETMAKING MADE EASY And "How to Make Formica Counter Tops." Two excellent guides let you build kitchen cabinets and counter tops like professionals. Extraordinary guides bring master craftsmen's shortcut methods. Satisfaction guaranteed. Write: Japs, 126-P Seventh North, Hopkins, Minn. 55343.

FOUNDRYETTE 2400 F. 1½ to 48 lb. capacity. Circular 25¢. Kansas City Specialties, Box 193-P-8, Middleton, Wisconsin 53562.

WALNUT Bowls, Legs, Round Picture Frames, Gun-Stocks Lumber Moulding. Midland Walnut, Box 262, Savannah, Missouri 64485.

SKIL-CRAFTS Current 200 plus page catalog with world's largest, finest selection of Hobbycraft, leathercraft, artist supplies. Send \$1 for postage and handling; refunded on first \$15 minimum catalog order. Skil-Crafts, Box 105-P, Joplin, Mo. 64801.

CATALOG FULL SIZE FURNITURE PLANS—\$1.00. Refunded with first order. Traditional, Early American, over 135! Furniture Designs, 1425 Sherman, Dept. CP-82, Evanston, Illinois 60201.

RUGGED 18" METAL BRAKE Make For Under \$10.00 Plans \$3.00. Holder's, 27851 Encanto Drive, Sun City, California 92381.

BUILD YOUR OWN BEAUTIFUL FURNITURE. Complements any furniture style. Complete step by step instructions and drawings. 2X5X3½ Home bar, liquor storage shelves, Plan HB672PM, \$4.00. 2X6X1½ Coffee table, center storage section, inlaid top, Plan CT472PM, \$3.00. Frankland Enterprises, Box 61039, Houston, Texas 77061.

DACHSHUND SPOOL O'THREAD HOLDER. Holds 18 spools. Use Scrap Lumber, Dowels, Instructions, Full Size Pattern. Send 60¢ To: Dachshund, 317 Reno Street, New Cumberland, Penna. 17070.

20 PLANS—Full Size—Novel Items For Fun or Profit. Send \$2.50. Cerbone—Box 18099—Philadelphia, Pennsylvania. 19147.

100 JIGSAW Patterns for pleasure—Profit—\$1.00. Lynds, Medway, Mass. 02053.

HOME REMODELING

CERAMIC Wall Tile Instructions \$3.00. Don Haskins, Union Street, E. Bridgewater, Mass. 02333.

DO-IT-YOURSELF

SAVE MONEY Servicing your own fire extinguishers. **NEW VALUABLE GUIDE.** Send \$1.00 Satisfaction Guaranteed! Fire Safety Equipment, 232F Windsor Parkway, Hempstead, N.Y. 11550.

YOU CAN PAINT YOUR HOUSE. My 30 years experience can help you. Save time and money, get professional results. Each area detailed. Easy way is right way. Send \$2.00. Fred Morrison, 8047 Dorian Way, Fair Oaks, Calif. 95628.

CONVERT MOWER Engines into air compressors. Write: Showalter, Box 409, Abilene, Kansas 67410.

BURGLAR-FIRE Alarm Supplies and Information. Free Catalog. Protecto Alarm Sales, Box 357A, Birch Run, Michigan 48415.

HOT Water from the sun. Plans, instructions, material list. \$10.00. Solar-Pak, P.O. Drawer 23585, Tampa, Florida, 33622.

REPAIR MINIBIKES, LAWNMOWERS, BICYCLES. Sewing Machines, Auto Engines. Build concrete, Plywood, boats, trailers. Over 100 How-To-Do books. Free brochure. Sincere, Box 10422, Phoenix, Arizona 85016.

BAROMETER Make for under \$2.00. Educational, conversation piece, plans 50¢. Send Stamped, Self Addressed Envelope. Thomas, Box 104, Millbury, Mass. 01527.

HOUSEHOLD Electrical Guide \$1.00. Bert Moon, Box 69, Central Islip, New York 11722.

TRY MY HANG GLIDER Plans-\$1.00. Walker, 5754 Tilbury, Lakewood, Calif. 90713.

DO-IT-YOURSELF! Save Money! 484-page, big, illustrated catalog/guide. Latest parts, tools, supplies, electrical equipment. \$1.95 ppd., refundable. Do-It-Yourself Supply, Box 1196X, El Monte, Calif. 91734.

ALL ABOUT LOCKS AND LOCKSMITHING. Fully illustrated do-it-yourself book. Only \$5.95. Hawthorn, 70 Fifth Avenue, New York, N.Y. 10011.

SAVE! Build-Your-Own Plans. Portable Electric Power Plant from used parts and 110 Volt power on your car. Information/photos \$1. B-UR-0, 34161-B-JH-Coast Hwy., Dana Point, Calif. 92629.

SAVE MONEY! "How-to" books—Appliance repair, Home improvement, automotive, crafts, hobbies, etc. Free details. Vernco, Box 121, Whittier, Calif. 90608.

WATERBEDS—Build inexpensive frame yourself, save hundreds on "The ultimate sensual pleasure". Any standard size mattress, liner, and frame plans. \$29.95 plus postage. Prices 50¢. Waterbeds, Box 3052, Falls Church, Virginia 22043.

POOL TABLE For Home use. Professional Quality. Specifications, 3-View drawing and information \$1.00 (Refundable). Tiercraft, P.O. Box 6117, Erie, Pa. 16512.

CABINET DOOR CLOSER Eliminates kitchen hazards. One minute installation, 180° invisible closed. 30¢ each, \$1.50 minimum order. M&R Associates, Box 337, Scituate, Mass. 02066.

ARTS AND CRAFTS

JEWELRY MAKING For hobby or profit. Send for free brochure showing complete kits and easy instructions. V. F. Ausura, 1565 Reservoir Ave., Roslyn, Pennsylvania 19001.

FREE: New handicraft catalog. Supreme Handicrafts, Box 395-PM, Sioux Falls, South Dakota 57101.

MAKE Figurines, plaques, lawn ornaments. Molds, plastercraft kits, liquid rubber. Sample and catalogue 10¢. Wooley Company, Box 29-B, Peoria, Illinois 61601.

"GETTING Started in Stained Glass" 25¢. Whittemore, Box 2065Y, Hanover, Mass. 02339.

FREE LITERATURE For sculptors showing how to make molds, cast plastics. Adhesive Products Corporation, 1660 Boone Avenue, Bronx, N.Y. 10460.

WORKABLE Artificial Fireplace, Decorative Cabinet. New space saver 55" long, 20¼" wide, 46½" high. Different contains over 17 cubic feet usable space for T.V., Setereo, Bar, Desk, Storage, Whatever. Build using plywood. Material list, instructions, complete easy to follow plans \$4.95. MMP Fireplaces, P.O. Box 1069, San Fernando, California 91341.

PICTURE FRAME MOLDING. Free List. R. E. Burt Corp., East Main, Cuba, N.Y. 14727.

MAKE Useful-decorative items for Home-Gifts-Profits . . . from the largest selection of **RESIN-CRAFT, CANDLE-CRAFT** and related supplies available anywhere. Illustrated catalog \$1. (refundable.) Specialty Products, Dept. B-1, 731 Brooks Road, Muskegon, Michigan 49442.

BINOCULARS, TELESCOPES, MICROSCOPES, MAGNIFIERS

FREE Binocular, Rifle scope catalog. Discount sale. Save 50%. Free gift with order. Write, United Binoculars, BN-4808, 9043 So. Western, Chicago 60620.

TELESCOPES (Reflectors) complete Kits. Other accessories, request free literature. Criterion Manufacturing, Dept PM 32, Hartford, Connecticut 06101.



CAMERAS AND EQUIPMENT

FREE! FREE! BARGAIN BOOK Central Camera Co., Dept. 381, 230 S. Wabash, Chicago, Ill. 60604.

JAPANESE, German Equipments! Exceptional Savings! Mandarin, 214 Shaws Building, Hong Kong.

PHOTO & PHOTO SUPPLIES

GALERIE. Cluster Pictures on Dimensional Wall Display Kit. Decorative Contemporary. Send For Color Brochure. Coda, 43 N. Dean, Englewood, New Jersey 07631.

(Continued on next page)
COURTESY: SHAW-WALKER, JR. PHOTOGRAPHY

PHOTO FINISHING

CAMERA FANS! Expert photofinishing by one of Country's largest labs at lowest prices. Fast service and free "Foto-Fan" Stamps you quickly redeem for valuable Photo Supplies. 8MM Kodachrome \$1.29; 8 Exp. Kodacolor \$1.79; 35MM Kodachrome 20 Slides \$1.39; 8 Exp. Black White 69¢. Satisfaction guaranteed. Send exposed film or request free mailers, complete Price List and Gift Catalog. Direct Mail Photo, Box 8352-PM, Pittsburgh, Pa. 15218.

COLOR SLIDES

35MM COLOR Slides. 10,671 Individually sold. Described, Encyclopedia catalog 10¢. Wolfe Worldwide, Dept. 14-82, Los Angeles, Calif. 90025.

MOTION PICTURES AND SOUND EQUIPMENT

UNUSUAL Movie supplies. Free circular. Esor, 47th Holly, Kansas City, Missouri 64112.

16MM SOUND Features, Shorts, New used for Sale. Free Catalog. National Cinema, 333 W 57th St.—N.Y.C., N.Y. 10019.

FREE! 64-Page catalog. 8-16mm film supplies, processing equipment. Superior, 448 N. Wells, Chicago 60610.

CLASSIC 8MM. MOVIES . . . 35MM. 2"x2" Color Slides. . . largest selection anywhere! Silent classics, comedy, history, sport, news, documentaries, features, others! 16mm. films also. Free catalog. Blackhawk Films, 569 Eastin-Phelan Bldg., Davenport, Iowa 52808.

16MM Classics. Illustrated catalog 25¢. Manbeck Pictures, 3621-PM Wakonda Drive Des Moines, Iowa 50321.

RADIO, TELEVISION AND HAM EQUIPMENT

36¢ RADIO & TV Tubes. Free catalog. Cornell, 4213-17 University, San Diego, California 92105.

SAVE Money on parts and Transmitting—receiving tubes. Foreign—domestic. Send 25¢ for giant catalog. Refunded first order. United Radio Company, 56-PM Ferry Street, Newark, N.J. 07105.

GOVERNMENT Surplus receivers, transmitters, snooperscopes, parts. Catalog. 25¢. Meshna, Nahant, Mass. 01908.

HIFI TAPES, RECORDS AND ELECTRONICS

8 TRACK Stereo Tapes, values to \$12.95. Pop, Country, Jazz, Soul, Rock. Reduced below cost. Send 25¢ for catalog. Harmony, Box 5836PMB, Concord, California 94520.

IRISH Cassette Promotion Buy 4 261-C60 for \$4.40 get FREE Plastic Storage Case. Holds 12—add 50¢ for Shipping. Send to: Direct Mail Corp., P.O. Box 71, Plainview, New York 11803.

FREE Catalogues, 2000 hard to find unusual records. Rose's Records, Box 7216, Louisville, Ky. 40207.

GOLDEN Age Radio. Complete taped shows, Box 8404-M, St. Louis, Missouri 63132.

OLDIES! 45 RPM Original Hits Catalog 50¢. C. & S. Record Sales, Box 197, Wampsville, New York 13163.

FREE Catalog—Electronic Kits—Amplifiers—Preamplifiers—Psychedelic Strokes—SCA Adaptors—Color Organs—Digital Instruments—Guitar Amplifiers. FREE Subscriptions. SWTPC, Box PM32040, San Antonio, Texas 78284.

OLD Radio Programs. Catalog \$1.00 (Refundable). Radio Vault, Box 9032-P, Wyoming, Michigan. 49509.

8-TRACK Stereo Tapes or Cassettes—Complete Selection—Order by title. \$3.50—4 for \$12.00. Regal, 1252 Pendleton St., Greenville, S.C. 29611.

STEREO ACCESSORY And maintenance line needs new distributors. Operate from your home with no overhead. Be your own boss. Send \$10.00 for complete sample kit, prices and fact sheets. Or—\$100.00 + \$5.00 partial freight for dealers starter kit—value \$422.00. (limit 1) **UNITED STEREO ACCESSORIES**, P.O. Box 524, Costa Mesa, Calif. 92627.

FREE Stereo 8 Track Tapes for 90 Seconds of your Time. Sound Sales, Box 14, West Union, Iowa 52175.

BEST Buy! Unrecorded Cartridges, Cassettes, and Supplies for those who load their own. **PLAYTRADE**, Box 5562, Toledo, Ohio 43613.



MUSIC AND MUSICAL INSTRUMENTS

WE Pay All Recording Costs on accepted material! Need new Song Material for immediate recording! Grand Recording, 1354-PM Hancock St., Quincy, Massachusetts 02169.

ACCORDIONS And Amplifiers! New-Used. Cordovox, Excelsior—Top Makes! Save to 50%. Direct factory dealer. Terms. Trades accepted. 5 day home trial. Free catalog—Discount prices. Write: Accordions Unlimited, Dept. R, 3147 North Luna, Chicago 60641.

GUITAR MAKING Books. Imported Woods, Supplies, Accessories. Catalog 25¢. Guitar Center, Box 15444, Tulsa, Okla. 74115.

REGINA Music Boxes 15½ Disc Spring or Electric Operated Brochure. Regina Music Box, Sawnee Bean Road, Thetford Center, Vermont 05075.

EASY To Play And Make, Quality Dulcimers, Banjos, Thumb Pianos; Instruments And Kits. Can Be Profitable Hobby. **HERE**, Inc., #P, 410 Cedar Avenue, Minneapolis, Minn. 55404.

LEARN TO READ MUSIC In one Evening. Amazing New Book Shows How! \$3.00 Postpaid. Cliff Bantel, Box 2086, Capistrano Beach, Calif. 92624.

GUITARISTS!!! Fantastic Savings—Guitars: Amplifiers—Popular name brands, largest selection. Money Back Guarantee!!! 32 page illustrated discount catalog. Send 25¢ today: Guitars Unlimited, Box 343, Dept. PH, Richland, Washington 99352.

30% TO 50% DISCOUNT! Any Model: Guitar, Amp, Drum, Banjo, Dobro! Free Catalog! Warehouse P24, Box 16399, Fort Worth, Texas 76133.

ACCORDION Top brands. Buy direct. Tremendous discounts. Trades accepted. Free brochure PM. Accordion-O-Rama, 874 Broadway, N.Y.C. 10003.

PLAYER Piano Rebuilding—get details from: Vestal Press, Vestal 11, N.Y. 13850.

ACCORDION Manufacturing. 6846-P North Avenue, Chicago, Illinois 60635. Concertinas, Hohners, Chromatics, Guitars, Drums. New, Used, Tuning, Repairing. Wholesale Catalogs Free.

VIOLIN And Guitar makers—send for latest Free Catalogue of woods & accessories. International Violin, PM1, 414 East Baltimore St., Baltimore, Md. 21202.

LEARN Banjo. 5-String Bluegrass. No music. Makes learning easy. Free details. Blaylock, Box 25-M, Marietta, Georgia 30060.

POEMS Wanted for songs. Nashville Music Productions, Box 40001-P, Nashville, Tennessee 37204.

WHOLESALE Musical Instruments—Accessories. Allied, 573 Route 17, Paramus, New Jersey 07652.

SWISS Music Boxes, Movements. Tunes To Order. Spielman, 55 West 42nd. New York 10036.

SONGPOEMS, SONGS! Urgently Needed, Possible Recording/Publishing. 50-50 Agreement. Betty's Music Makers, 1417 Park Building, Dept. B, Pittsburgh, Penna. 15222.

LEARN Guitar Fast. Play Any Song Using Only Five Simple Chords. Satisfaction Guaranteed. \$1.98. Jamie, Box 179, Lake Jackson, Texas 77566.

WHOLESALE Professional Guitars, Amplifiers, PA Systems, Free Catalog. **CARVIN**, Escondido, Calif. 92027.

PIANO AND ORGAN LEARNING MADE EASIER. A natural for the beginner. Details free. Keyboard Decals, Dept. PM82, Box 8985, Orlando, Florida 32806.

PSYCHEDELIC And Sexodetic Lamps Tremendous \$5.00 Each. Guaranteed. Insharp, Box 321, Sanborn, New York 14132.

30% DISCOUNT Name Brand Musical Instruments. Free Catalog. Freeport Music, 455F Route 110, Melville, N.Y. 11746.

KITS! Build dulcimers, guitars, balalaikas, thumb pianos, harps. From \$2.95. Finished dulcimers from \$19.95. 8665 West 13th Avenue, Denver, Colorado 80215.

FREE Recording. Details. Newart Publications, Box 693, Syracuse, New York 13201.

POEMS Set to music. Songs recorded. Send poems, songs. Crown Music, 49-C West 32, New York 10001.

CONSERVATION TRAINING

GAME WARDEN, Government Hunter, Forestry, Park & Wildlife Service announce job openings regularly. Prepare at home for outdoor work, good pay, security. Approved for Veterans! Free! "Conservation Career Kit." North American School of Conservation, MP, Newport, California 92663.

SURVEYING TRAINING

SURVEYING Transit Level Kit; Instructions \$5.00. Box 413, Altadena, Calif. 91001.

EDUCATION AND INSTRUCTION

FINGERPRINTING—Investigation. Exciting, secure career. Learn at home. Free book. State age . . . Institute of Applied Science, 1920 Sunnyside, Dept. 168, Chicago, Illinois 60640.

WATCH REPAIRING. Unique home study course. Free information. Chicago School, YH, Fox River Grove, Illinois 60021.

BIG Profits—Real Estate. Invest, sell. Broker. Free Booklet. Prepare at home. Approved, Veterans. Weaver School, 3519-PB Broadway, Kansas City, Missouri 64111.

BECOME Medical Laboratory Technician. Study at home. Licensed school. Write: Med Tech School, Box 491, Hollywood, Florida 33020.

HIGHLY Effective, Profitable Short Courses. (75 Choices). Study At Home. Diploma Awarded. Our 27th Year. Free Literature. CIEE-25, Box 10634, Jackson, Miss. 39209.

COMPLETE YOUR HIGH SCHOOL At home in spare time. Texts furnished. No classes. Diploma. Our 75th year. Free Brochure. American School, Dept. XC45, Drexel at 58th, Chicago 60637.

PIANO Technology—Electronic organ servicing, learned easily at home. G. I. Approved. Free booklet. Niles Bryant School, Dept. P, 3631 Stockton, Sacramento, California 95820.

LEARN To Fix Typewriters. Desperate shortage trained men. Hundreds needed. Make up to \$25 in one hour. Learn at home in spare time. Industry Approved course. Facts free. Send name. Typewriter Repair School, Dept. 3310-082, Little Falls, New Jersey 07424.

LEARN Auctioneering. Term soon. Free catalog. Reich Auction College, Box 850, Mason City, Iowa 50401.

(Continued on next page)

EDUCATION AND INSTRUCTION

(Continued from preceding page)

EXTENSION And Post-Graduate Awards in Philosophy, Art, Sciences, Botanic Medicine, Homeopathy, Radionics and others. 30 subjects. Curricular free (airmail \$1.00 refundable). Registrar, Sussex College of Technology, Highfield, Danehill, Sussex, England.

HIGHLY EFFECTIVE Home study courses in Electronics Engineering Technology and Electronics Engineering Mathematics. Earn your Degree. Write for Free Descriptive literature. Cook's Institute of Electronics Engineering, (Dept. 10), P.O. Box 10634, Jackson, Miss. 39209. (Established 1945).

PIANO Tuning quickly learned with home study course. Diploma granted. American Tuning School, Gilroy, Calif. 95020.

DETECTIVE Course. Free Information. Universal Detectives, Box 8180-F, Universal City, California 91608.

AUCTIONEERING. Resident or home Study Course. Free Catalog. Nashville Auction School, 2004 West End, Nashville, Tennessee 37203.

AUTOSUGGESTION. Sleep-learning headquarters! Tapes, records, books, Gigantic catalog free. Research Association, Box 24PM, Olympia, Washington 9851.

USED Courses! Books! List 10¢. Smith's, 124 Marlborough, Salem, Massachusetts 01970.

UNLOCK Your Future. Become professional Locksmith by spare time home-study. Make up to \$6 per hour. All tools, equipment incl. Facts Free. Send name. Locksmithing Inst., Dept. 1310-082, Little Falls, New Jersey 07424.

GRAPHOANALYSIS—Learn scientific handwriting analysis for profit, pleasure. Free sample lesson, catalog, reveals plan. Write: Igas Inc., 325 Jackson, Dept. 2EY-2, Chicago 60606.

PERFECT Husband-wife business. Learn Upholstery at home. Make \$10 in an hour. Buy—repair—sell for even bigger profits. Kits, tools included. Free Booklet. Upholstery & Decorating School, Dept. 5310-082, Little Falls, New Jersey 07424.

RELIGIOUS VOCATION? Write: Church Of Holy Light Inc., P.O. Box 4478, Pittsburgh, Pa. 15205.

DETECTIVE Profession. Easy home study; free tie-tack or lapel pin, certificate, future. GI approved. Professional Investigators, Box 41345, Dept. CP, Los Angeles, Calif. 90041.

USED Courses! Books. Catalog 10¢ (Courses Bought). Lee Mountain, Pisgah, Alabama 35765.

DETECTIVE And Fingerprinting Courses. Write. Detectives, Box 185-P, Fairfield, Alabama 35064.

LEARN TO WELD—Arc, Pipe, Gas, TIG, MIG, Plasma. Free Bulletin. Write, phone or visit. Approved Ohio No. 70-12-0064-HT. **HOBART SCHOOL OF WELDING TECHNOLOGY**, BOX 72, TROY, OHIO 45373.

THOMAS A. EDISON COLLEGE Master's & Doctor's "OFF CAMPUS" Degree Programs in Religion & General Education. Write: TAEC, Box 688, Palm Beach, Fla. 33480. For Catalogue send \$1.00.

GET A British Degree. Divinity. Philosophy, Radionics. 35 Courses. Prospectus free. Brantridge Forest School, Highfield, Dane Hill, Sussex, England.

OWN Collection agency. "Little Gold Mine!" Franklin Credit, Roanoke, Virginia 24004.

SEWING Machine Repairing. Unique instructions. Lucrative profits. Diploma awarded. Gresslin Correspondence School, Box 927, Spencer, Iowa 51301.

LEARN Asleep or awake! Records, tapes, equipment! Free catalog! Drawer PM-400, Ruidoso, New Mexico 88345.

CIVIL Service HandBook \$4.95—Complete Guide to Civil Service Jobs \$4.95—Home Study Course in Civil Service Jobs \$11.95—No postage—Jackson Supply, Mt. Liberty, Ohio 43048.

COLLEGE Degree at home. Your choice of subjects incl. law. Easy tuition plan. Williams College, 445 East Second South, Salt Lake City, Utah 84111.

PRACTICAL Educational Books, Free Details: I.D.C., P.O. Box 133 PM, Caldwell, New Jersey 07006.

FREE Book tells how to gain profitable skill in understaffed field as camera repair technician. **APPROVED FOR VETERANS TRAINING.** Home study or classroom. National Camera, Dept. EAC, Englewood, Colo. 80110.

HOW TO DEVELOP YOUR E.S.P. POWERS! Amazing Record Series now Available. Send for **FREE** Information. No Obligation. Hallstrand Enterprises, 12221 Whittier Blvd. Dept. P8, Whittier, Calif. 90602.

IF YOU Really want to succeed at life, my **LETTER FROM A FRIEND** will help you as it has helped so many others. Send \$1.00 for this indispensable guidance. ERB, Box 21008, Philadelphia, Pa. 19154.

ORDINATIONS. Lifetime! Church chartered 1887! Write! 708 Bragg, Monroe, North Carolina 28110.

ALTERNATOR Generator and Starter Rebuilders Courses. See Auto Supplies and Equipment.

COMPUTER ELECTRONICS—Complete Course teaches basics of Logic Design—handy devices you can build! Free Details. Dynasign, Box 60-M, Wayland, Mass. 01778.

FORGETFUL? Develop powerful memory quickly with our astonishing, proven method. \$2.00 Guaranteed. Sigma, P.O. Box 91033-A, Cleveland, Ohio 44101.

MEN, WOMEN Break barrier now. Earn \$9,000-\$20,000 annually. Automobile Sales Industry needs thousands. Free Aptitude Test. Job Assistance. FVASS, Box 628P, Botsford, Conn. 06404.

VETERINARY ASSISTANT—Train at home in spare time for animal care career. Unlimited opportunities—hospitals, shelters, zoos, pet shops, kennels, laboratories, etc. Send for **FREE "Career Kit"**. North American School of Animal Sciences, AZ, Newport Beach, California 92663.

SURVEYING PAYS BIG!! United States Department of Labor reports "Openings" for 26,000 Surveyors in next ten years. Easy home-study plan guides you. Send for Free "Surveying Career Kit." North American School of Surveying, AZ, Newport Beach, California 92663.

LAUNCH New Career In 48 Hours. Management Studies, Box 17-434, West Hartford, Conn. 06117.

GAME WARDEN. Government Hunter, Forestry, Park & Wildlife Service announce job openings regularly. Prepare at home for outdoor work, good pay, security. Approved for Veterans! Free! "Conservation Career Kit." North American School of Conservation, AZ, Newport, California 92663.

LEARN BEGINNING ALGEBRA. Four workbooks and answers only \$3.00. Key Project, Box 2304A, Berkeley, California 94702

BOOKKEEPING Service. Operate your own. We train you. Universal Bookkeeping, Box 664-M, Springfield, Missouri 65801.

LIFETIME Ordination. **DOCTOR OF DIVINITY.** Church Charters. Details 25¢. Life Science Church, 2207 Cardinal, Rolling Meadows, Illinois 60008.

INSTANT High School Diploma, for lost Diplomas. Free Birth Certificate, only \$2.00. Steele, Box 122, Dept. 128, Cana, Virginia 24317.

FOR INVENTORS

U.S. PATENT Office Searches. 234 Broadway, Room 3615, New York 10017. Free invention certificates.

INVENTORS—If you have an invention for sale, patented or unpatented, write for free brochure outlining manufacturers requirements, royalty rates. Kessler Corporation, C-58F1, Fremont, Ohio 43420.

CHEMIST ANSWERS ALL. Trouble Shooting. Formulas, Consultation, Research. Free Information, Pamphlet, Burchette, Box 1114, Spring Valley, California 92077.

INVENTORS—Get Professional, independent evaluation of your ideas, inventions by experienced engineers before investing in costly patent and marketing services. Write: Invention Evaluation Services, Box 665, Marion, Ohio 43302.

PATENT Application Financing. Free patent search plan, Global Patent Division, 2420 77th, Oakland, Calif. 94605.

PROMOTE IT YOURSELF—Complete guide for inventors. Development thru sale: Quantum Group, 1529 Greenleaf, Evanston, Illinois 60202.

INVENTORS: Your ideas and inventions (patented; unpatented) expertly searched, developed for commercial appeal and cash/royalty sales to manufacturers by professional Invention Developer with excellent record of experience. B. S. Industrial Engineering; United States Patent Office former Patent Examiner. United States Government former Patent Advisor. Second decade reliable service! Member: United States Council International Chamber Commerce. Free "Invention Record" and "Recommended Protection Procedure." Airmailed! Write: Raymond Lee, Invention Developer, 230P-Park Ave., New York, New York 10017.

FREE PAMPHLET: "Tips on Safeguarding Your Invention." Write: United States Inventors Service Company, 501-P Thirteenth Street N.W., Washington, D.C. 20004.

INVENTORS—United States Patent Office Searches, Patent Development Engineering, marketing of inventions—ideas by Licensed Professional Engineer—Patent Engineer and United States Patent Office Former Examiner. Inventions developed for patenting and marketing. We are contacted by many manufacturers seeking to purchase appropriate new products invented by our clients. Send for Free Invention Certificates and Invention Information. Serving inventors since 1948. George Spector, Licensed Professional Engineer—Patent Engineer—3615 Woolworth Building, New York, N.Y. 10007.

PROSECUTE Your Own Patent Application. All Material, Three Booklets Including Step-By-Step Procedure—\$9.00, Inventors Service, Box 3574, Washington, D.C. 20007.

PATENT Searches including maximum speed, full airmail report and closest patent copies. Quality searches expertly administered with complete secrecy guaranteed. Free Invention Protection Form and "Patent Information." Write: Washington Patent Office Search Bureau, Benjamin Franklin Substation, P.O. Box 7167, Washington, D.C. 20044.

IMMEDIATE Cash, for patent applications. Free patent searches. Write for details. Universal Patents, 184-D, Marion, Ohio 45750.

BECOME Registered Patent Agent. Details. Sample Test \$5.00. Refundable. Patents, Box 282, Bonner, Kansas 66012.

DO-IT YOURSELF INVENTION PROMOTION. New booklet for inventors. \$3.00 postage paid. Harper, Box 66841, Houston, Texas 77006.

MONTHLY Information, news, analysis of invention business. Subscription \$12.00, copy \$1.50. Write: **SYNTHESIS** Magazine, Box 157-F, Manhattan Beach, Calif. 90266.

HOW To Make Patent Searches Anywhere \$3.00. Galaxy Research, (P) Box 8170, Kansas City, Mo. 64112.

(Continued on next page)

INVENTIONS WANTED

INVENTIONS Needed immediately for manufacturers. For additional information write: Kessler Corporation, C-581W, Fremont, Ohio 43420.

INVENTORS!!! Quick Action! 25 "No Advance Fee" Invention/Patent Buyers, Brokers—\$2.00. Speedline, B458, Woodriver, Ill. 62095.

INVENTIONS Wanted. Patented: unpatented. Tremendous manufacturers lists. Global Marketing Service, 2420G 77th, Oakland, California 94605.

FREE "Directory of 500 Corporations Seeking new Products." For information regarding developments, sale, licensing of your patented/unpatented inventions. Write: Raymond Lee Organization, 230-N Park Avenue, New York, New York 10017.

INVENTORS! Protect your ideas! Free "Recommended Procedures." Washington Inventors Service, 422F Washington Building, District of Columbia 20005.

INVENTORS! Don't sell your invention, patented or unpatented until you receive our offer. Eagle Development Company, Dept. H, 83 Wall Street, New York, New York 10005.

INVENTORS! Sell your invention for cash or royalties! Our client manufacturers eagerly seek new items. Patented. Unpatented. Financial assistance if needed. 25 years proven performance. For free information, write: Dept. 15, Gilbert Adams, Invention Broker, 81 Wall St., New York, N.Y. 10005.

INVENTORS! We will develop, sell your idea or invention. Our national manufacturer-clients are urgently seeking new items for highest outright cash sale or royalties. Financial assistance available. 15 year proven performance. For free information write: Dept. 47, Wall Street Invention Brokerage, 79 Wall Street, New York, N.Y. 10005.

WE Either sell your invention or pay cash bonus. Write for details. Universal Inventions, 28-E, Marion, Ohio 45750.

PATENTS FOR SALE

PATENTS Available (Five) Sale Or License. Speedline, B458, Woodriver, Ill. 62095.

MANUFACTURING

INVENTORS Ideas Developed. Research. Models. Manufacturing. Sales. Free Brochure. Since 1942. William Parker, Box 6305, Orlando, Fla. 32803.

BUY IT WHOLESALE

300,000 Products. Buy Direct. Imports Available. Details 25c. Midland Purchasing, Grimes, Iowa 50111.

FREE Membership. Wholesale Buying Club. Join Now. Renlee, 215P Golf Lane, Hewlett Harbor, N.Y. 11557.

HEARING Aids, batteries, Wholesale. Catalog 25c. Fiston, Box 1444, New Preston, Conn. 06777.

WORLD'S Largest wholesale dropship sources. U.S., foreign. Factory suppliers dropship direct to you or customers. Now! have your own catalog for pennies. Free details. International Buyers, Box 16386-M, Portland, Oregon 97233.

TELEPHONE Answering Machines. Robinson Associates, Box 2049-PM, Peabody, Mass. 01960.

BARGAINS! Buy wholesale and below. Name brands. Appliances, furniture, sports equipment, televisions, cameras, watches, jewelry, thousands more. Huge discounts to \$1,000.00 on new automobiles. All makes. Free details. Write today: Worldwide Bargainhunters, Box 730-A, Holland, Michigan 49423.

SAVE 30 TO 50% ON YOUR NON-Perishable Grocery Items. Free List . . . Established 1916. Pioneer, 416 S. Clare Ave., Harrison, Mich. 48625.

EXPORT-IMPORT

ORIGINAL Oil Paintings 16x20" \$72.00 dozen. Details 25c. McDaniel, 3632 Topax, Claymont, Delaware 19703.

JAPAN: 1200 Products directory. Illustrated Manufacturers' names, addresses. \$3.00. Send cash, Yamagata Office, 814 Togin Bldg., Marunouchi, Tokyo.

FOR THE HOME

HAVE YOU HAD IT WITH WATER IN YOUR BASEMENT? End your worries about sump overflowing due to power failure or pump failure. Install the battery operated **AQUA-NOT** emergency sump pump system and relax. Only \$219.00 plus car battery. Write for details: Aqua-Not, Inc., P.O. Box 133, Highland Park, Illinois 60035 AC 312/945-0808 Dealer/Distributor Inquiries Invited.

OF INTEREST TO WOMEN

PRO-TECTO-CANE While defending yourself, mark your assailant for future identification. Aluminum Cane with velvet soft handle and indelible marking powder \$8.95. Bremer Brease INC. 971 Washington Avenue, Macon, Georgia 31201.

1000% PROFIT Bronzing Baby Shoes. Free Literature. NBC, Box C-4-PM-3, Coral Springs, Florida 33065.

WANT A new car, color TV, new clothes? Learn hundreds of ways to make money. 5 month subscription **FREE**. Write: Salesman's Opportunity Magazine, Dept. 17-HO, 1460 Hancock Center, Chicago 60611.

\$100 WEEKLY Possible addressing mailing. Sparetime. Free details. Send self-addressed stamped envelope. Newby Publications, Box 20427-PM, San Antonio, Texas 78220.

\$6.00 DOZEN Paid lacing baby boots! Cowboy, Dozaw 9, Indiana 46580.

HOW To Make Money Writing Short Paragraphs. Information Free. Barrett, Dept. C-27-K3, 6216 N. Clark, Chicago 60660.

HOMEWORKERS! \$100.00 Weekly addressing for firms. Begin immediately. Details—send stamped, addressed envelope. Hamilton, 272-TM-8, Brooklyn 11235.

HOME Newspaper clippers needed. \$500 monthly possible. Details free. Foster, 272-MA-8, Brooklyn 11235.

WOMEN Needed Now to fill out income tax forms at home. We show you how. Simple, easy to learn, \$700 per month earnings possible. Details mailed free. No salesmen. Hurry. Federated Tax Service, 2039 Montrose, Chicago 60618.

FURNITURE SLIPCOVERS! 426 Grand Street, Brooklyn, New York 11211. Free Information Chart.

\$500 MONTHLY Possible addressing—stuffing envelopes (longhand—typing) at home. \$500 monthly Clipping news items from your newspaper. Information: Send stamped self-addressed envelope. American, Excelsior Springs, Missouri 64024.

HOMEWORKERS: \$75.00 Thousand Home Addressing Possible! For information send 25c and self-addressed, stamped envelope. William T. Clarke, Dept. PM, 11 Watson Avenue, East Orange, New Jersey 07018.

PEARLS, Jewelry, Artificial flower materials, Handicrafts. Wholesale discounts. Catalog 50c. Boycan's, D-14, Sharon, Pa. 16146.

ACNE! Simple Treatment. Thrilling Results. Send \$2.00 Complete Information. Box 177, Irvington, Alabama 36544

GIFT SHOPPING

FREE CATALOG Of Sensational Gifts and Novelties. J. & L. Co., 73-B Main St., New Paltz, New York 12561.

SHOPPERS Paradise! Sensational Savings! International Suppliers, Box K-3705, Hong Kong.

FREE Onyx Gift Catalog. **BALE'S**, Box 15123, San Diego, Cal. 92115.

FREE Spectacular Catalog. **NEWEST** Exciting and Useful Gift Ideas. Delphi-1C8, Box 31072, San Francisco, California 94131.

ONETHIRD OFF! BONUS OFFER! FREE Catalogs Gift and Household Items, Simulated Diamond Rings, Selfimprovement Books. Olive Enterprises, 1739 Lasenda, South Pasadena, California 91030.

HANDCARVED MEXICAN Trays, Hotplates, Ashtrays. Select from 52 different ceramic tile bases. Write **GCICO**, Route 1, Box 264T, Laredo, Texas 78040.

CHECK PROTECTOR—Dials dollars and cents to \$9,999.99 \$5.98 postpaid. D W S, Dept. 1B1, 12216 Michigan, Chicago, Illinois 60628.

SENSATIONAL FREE GIFT CATALOGUE! Charles Moreland, 29163 Hook Creek Road, Lake Arrowhead, Calif. 92352.

MAILORDER RECORDS help get increased business! Complete 32 Page Record Book shows your inquiries orders, advertising, expense, etc. Only \$1.00. **C. A. MARTIN, POPULAR MECHANICS, DEPT. PMR, 224 WEST 57 STREET, NEW YORK, N.Y. 10019.**

WATCHES, OLD GOLD, JEWELRY

HIGHEST CASH For Gold, Jewelry, Gold Teeth, Rings, Diamonds, Watches, Silver, Platinum. Mail Articles Today. Free gift with Information. Chicago Gold & Precious Metals, 6 E. Monroe, Dept. 1258, Chicago, 60603.

WANTED . . . Gold, Silver, Platinum (any form), Coins. Information Free. Wilmoth's, 1067-A Bridge, Grand Rapids, Mich. 49504.

COMPLETE Watchmakers'—Jewelers' Catalog \$1.00. Snell-Bengal, 205 Helm Building, Fresno, California 93721.

WATCH And clock repairing books. Free catalog. North American, Box 77-AV, Fox River Grove, Illinois 60021.

CASH Immediately for Old Gold, Jewelry, Gold Teeth, Watches, Diamonds, Spectacles, Silver, Platinum, Mercury. Free Information. Rose Industries, 29-A East Madison, Chicago 60602.

SAVE ONETHIRD On Prices of beautiful Merlite Gem Rings. Limited time. **FREE** Catalog. Olive, 1739 Lasenda, South Pasadena, California 91030.

WEARING APPAREL

PROFITS FROM CLASSIFIED ADVERTISING! Booklet shows you how to start your own business with Classified Advertising. Only \$1.00 (Refundable with first order.) **C. A. MARTIN, POPULAR MECHANICS, DEPT. PMP, 224 WEST 57 STREET, NEW YORK, N.Y. 10019.**

HEARING AIDS

HUGE SAVINGS. Eliminate dealer mark-ups. Free Trial. Batteries Wholesale. Terms Arranged. Lloyds-PMC, Rockford, Ill. 61108.

IMPROVE YOUR HEARING Information Absolutely Free. Rhodes, Box 518-PM, Paducah, Ky. 42001.

HEARING Aids—Huge savings on tiny, all in the ear, eyeglass, behind the ear and body models. Free home trial. Low as \$10 monthly. Write for free catalog. Prestige, Dept. R-6, Box 10947, Houston, Texas 77018.

WHOLESALE Discounters! Famous Aids! Batteries! Repairs! AidMart, Box Z, St. Petersburg, Florida 33731.

(Continued on next page)



SCIENCE AND CHEMISTRY

CHEMISTRY And Biology Catalog 35¢. Boulevard Laboratories, Suite 302, 3114 E. 83rd St., Chicago, Ill. 60617.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 50¢. Dept. M-50, Biological Supply Co., 1176 Mt. Hope Ave., Rochester, N.Y. 14620.

CATALOGUE Of those ver-ry hard-to-find chemical products, things that go boom, multi-stage rockets, 500 How-To books, 10,000 formulas of every conceivable mixture in science and industry. 50¢. Kenrus-C, Box 158M, Staten Island, New York 10309.

LABORATORY Supplies at discount prices. Catalogue—35¢. Deluxe Scientific; Manitowoc, Wisconsin 54220.

SECRETS OF THE PYRAMIDS Exciting Experiments Complete Plans For Working Model. \$1.00. CIP, 5951 Grace, Chicago, Ill. 60634.

ROCKET Kits, engines, launchers, accessories. Send 25¢ for packet of Iron-ons, decals, literature. Fast service. **ASTRONAUTICS**, Box 77F, Mineral Point, Wisconsin 53565.

FORMULAS, PLANS, ETC.

ANY FORMULA—\$5.00. Catalog—Manufacturing Treatise 25¢. Belfort, 192 N. Clark, Chicago 60601.

SMOKE MEAT FISH Game. Instructions remodel used refrigerator—Make Smoke house. Recipes smoked lunchmeat, weiners, pepperoni, salami, jerky. \$2.00 to: Meat Smoker, 2009 F West, 7800 South, West Jordan, Utah 84084.

PLASTICS

FIBERGLASS Resins, Mat Cloth, Roving For Molding, layup. **PLEXIGLASS** Sheets, Rods, Tubes, Marine Plastics. P. O. Box 1844, St. Louis, Mo. 63118.

LARGEST Handicrafts Supply Catalogue \$1.00 (Refundable). R.P.H. Manufacturing, 24-M-8 Winter, Stamford, Connecticut 06905.

EMBED Flowers, Shells, Minerals, Coins. Photos, Anything, in clear Castolite. Cast paperweights, desksets, keytags, fine gifts, decorative accessories. Make flexible molds over any patterns, any size. Reproduce your own designs in plastics, metal, plaster, cement, wax. No tools required. Highly profitable. Manual 25¢. Castolite, 721/PM, Woodstock, Ill. 60098.

TREASURE FINDERS

TREASURE Hunters! Prospectors! Relco's New Instruments Detect Buried Gold, Silver, Coins, Minerals, Historical Relics. Transistorized. Weights 3 Pounds. \$19.95 up. Instant Financing Available. Free catalogue. Relco, Dept. A-40, Box 10839, Houston, Texas 77018.

POWERFUL Metrotech locator detect gold, silver, coins, relics. Moneyback guarantee, terms. Free information. Underground Explorations, Dept. A, Box 793, Mento Park, California 94025.

FREE 140 Page Detector Catalog. General Electronic Detection Co., Box 67, Bellflower, California 90706.

SEARCH Treasure Finders. Locate gold, silver, coins, relics. Operate underwater. Money back guarantee. Free information. Search Electronics, Box 8396-A, St. Petersburg, Florida 33738.

FIND Buried treasure with revolutionary patented, analytical metal detector. Features push button and automatic tuning, negligible ground pickup, greatest range. Free catalogue. Gardiner Electronics, Dept. 9, 4729 N. 7th Avenue, Phoenix, Arizona 85013.

TREASURE Hunters! Prospectors! Rockhounds! Hobbyists! Find gold, silver, relics with world famous Detectron Metal Detectors. Free information. Delivery immediate. Detectron, Dept. 8PM, Box 243, San Gabriel, California 91778.

NOW! Enjoy the great outdoors in comfort with your pocket size electronic Skeeter Skat mosquito repeller. \$9.95 postpaid. U.S.A. Satisfaction guaranteed. Detectron, Dept. F-8, P.O. Box 243, San Gabriel, California 91778.

FISHER DETECTORS. You deserve the best! Free literature. FRL, Dept. PM-8, P.O. Box 490, Belmont, California 94002.

FREE—VALUABLE TREASURE FINDER Catalog sent by return mail. Find Coins, Rings, Gold, Silver, Metals, Relics, Write Today. JETCO, Dept. CPM, Box 26669, El Paso, Texas 79926.

GOLD MINERS. Work Streams or Deserts. Portable Gold Saving Machine. Plans \$5.00. Ready Built Kit \$87.00 + Ship. Engine Pump \$150.00 + Ship. Placer—P.O. Box 548, Sulsum, Cal. 94585.

GOLDAK Treasure locators—Pleasure and profit in a hobby you'll enjoy. Find coins, relics, gold, silver. Charge on BankAmericard. **GOLDAK**, Dept. PM 1101-A, Air Way, Glendale, California 91201.

PRECIOUS STONES & MINERALS

500 POLISHED Gemstones \$5.00. Tumblers, 5401 James North, Minneapolis, Minn. 55430.

EARTH Science Rockhound Magazine. Subscription \$3.00. Sample \$4.00. Box-550-PM, Downers Grove, Ill. 60515.

GET Free catalog no serious rockhound, gem cutter, jewelry maker, hobbyist or craftsman can be without. Full of bargains, exclusive items, low prices from largest suppliers and authorities in the field. Free new catalog just off the press, yours for the asking. Write: Grieger's, Dept. C-12, 1633 E. Walnut, Pasadena, California 91106.

RECEIVE An interesting and different mineral specimen each month. Free information. Mineral Of The Month Club, Box 487-AD, Yucaipa, Calif. 92399.

CARTOONING, COMMERCIAL ARTS, SHOWCARD & SIGN PAINTING

COMPACT 23 lesson Cartoon Course and Cartoonist's Magazine. \$2.00. Hartman, Box 30367, Lincoln, Nebraska 68510.

MODERN Cartooning taught by mail. Write for free brochure. Cartoonorama—Box 263-4G, Branford, Conn. 06405.

SIGN Painting—\$1000 per Month Part-Time. Free Catalogue. Kaufmann Supply, Centertown, Missouri 65023.

CARTOON For Money!! Big Free Book: Success, Box 885-C, Dearborn, Mich. 48121.

SIGNS! Make-your-own! **SIGN-RITE** Vinyl Self-Adhering Letters and Numbers! 5 Large Sizes! 4 Types! 8 Colors! Over 20,000 to select from! Inexpensive! Prompt Service! **FREE BROCHURE!** Aircraft Mfg. Co., Box 25034 Northgate, Seattle, Wash. 98125.

LEARN Sign painting at home. Free Talent test. Ben Kerns, Box 812-PM, Greenville, S.C. 29601.

"HOW TO MAKE MONEY WITH SIMPLE CARTOONS"—Informative book sent **FREE** tells way to big income. Cartoonists' Exchange, 98, Pleasant Hill, Ohio 45359.

ADVERTISING AGENCIES, ADV. SERVICE, MAILING LISTS

ADVERTISING Ratebook leading newspapers, magazines, 25¢. Chicago Advertising Agency, 28-E Jackson, Chicago 60604.

MAILORDER BUYERS' NAME LISTS. Gummed Labels \$9.00 per 1,000. N. D'Amato, Box 385, Port Jefferson Station, New York 11776.

MAILING LIST. Gummed labels. Major variety, chain drug, food, dept. stores, jobbers, 300 M.O. firms, 1300 labels under 3¢ ea. cover 50,000 firms, 49 States, Mail \$35.00. J. Ryan, 114 E. Preston, Baltimore Md. 21202.

MAILING List. Most all Kinds. \$9.00 1000 Gummed, Circulars mailed \$5.00 1000. Dixmailers, King, North Carolina 27021.

TYPEWRITERS, DUPLICATORS, OFFICE EQUIP.

TYPEWRITERS; Surplus good used Standard, Office and Portable Models \$24.95. Macrie's, 639 Bremen, Egg Harbor, New Jersey 08215.

RUBBER STAMPS

ADDRESS Stamp 85¢. Signature \$2.80. Catalog, Carol's, McLoud, Okla. 74851.

FREE 48 Page Catalog. Rubber stamps, printing, office supplies. Youngers Stamp Shop, Princeton, Iowa 52768.

NAME Stamp \$1.00. Free Catalog. Rush Stamps, 132 Farmcrest, Rush, New York 14543.

PICTURE Catalog. Lowest Fastest Best. Newton Industries, 1071 Prosser Avenue, Prosser, Wash. 99350.

RUBBER Stamps, 3 lines, \$2.00. Catalog 25¢. Tabco, Tomkins Cove, New York 10986.

THREE LINES—\$1.50, Four Lines—\$2.00 Maximum 27 Letters Per Line. T-Gordon's, Box 741P, Reseda, Calif. 91335.

OFFICE SUPPLIES

MAILORDER RECORDS help get increased business! Complete 32 Page Record Book shows your inquiries orders, advertising, expense, etc. Only \$1.00. C. A. MARTIN, POPULAR MECHANICS, DEPT. PMR, 224 WEST 57 STREET, NEW YORK, N.Y. 10019.

PRINTING PRESSES, RUBBER STAMP OUTFITS

SAME Day shipment on rubber stamp supplies. Revised wholesale price list No. 7 free. Star Stamp Supply, 732 Federal, Chicago, Ill. 60605.

SIMPLE-X RUBBER STAMP PRESSES. Hydraulic operated, electrically heated. Sizes 5"x8", 8"x12", 10"x15". Starting outfits Orders for presses, supplies shipped day received. Free catalog low supply prices. Send \$1.00 for postage and handling (refundable on first order). Custom Manufacturers, 406-P East Elm, Springfield, Missouri 65801.

RUBBER Stamp outfits, supplies. Kiewiet, 2025 Barney Road, Kalamazoo, Michigan 49007.

PRINTING Presses, type, supplies, lists, 10¢. Turnbaugh Service, Mechanicsburg, Pennsylvania 17055.

TYPE Catalog No. 12, 120 pages. Send One Dollar. Deductible First Order. Acme Type, 732 Federal, Chicago, Illinois 60605.

LOW Priced Rubber Stamp Manufacturing Supplies, Starting Outfits. Martin, 1432 Major, Jefferson City, Missouri 65101.

MAKE Your own self molding Rubber Stamps and printing cuts. Plexirubber, Argyle A Wisconsin.

\$1.00 LISTS You year sent to 1000 Importers, Jobbers, Mailers, our mailing year. Dixiem, King, North Carolina 27021.

PRINTING AND SUPPLIES

PHOTO OFFSET Printing, 500 (8½" by 11") copies \$6.50, 1,000 copies \$9.50. Nationwide Printing, Atlanta, Ill. 61723.

(Continued on next page)

Materials and equipment available in person

PRINTING AND SUPPLIES

(Continued from preceding page)

1,000 BUSINESS Cards, Letter Heads, Note Heads, And Call Notes \$4.95. Superioex, Avon Lake, Ohio 44012.

BUSINESS CARDS Raised Letters \$5.65 Thousand, Like Engraved, Free Samples. Kavanagh, Box 1222, Brooklyn, N.Y. 11202.

BUSINESS Cards, Rubber Stamps, Printing, Free Literature, Jordan's, 552 West O'Connor, Lima, Ohio 45801.

ECONOMICAL Printing: Stationery, Forms, Labels, Business Cards, Burnfin, Weaubleau, Mo. 65774.

GUMMED LABELS

1,000 GUMMED ADDRESS LABELS \$1.00 FREE CATALOG, Acme Supply, Dept. PM-82, 1238 Voskamp, Pittsburgh, Pennsylvania 15212.

1,000 GUMMED Address Labels \$1.00. Walt's, Box 966A, South Bend, Indiana 46624.

1000 DELUXE, Gold Stripe, Padded Labels. Send name, address and zip code. \$1.00. Free plastic box with order. D'Lynn's Shop, 2011 W. Bond St., Denison, Texas 75020.

1000 DELUXE Address Labels, \$1.00, Alton Howell, 1512 Orange Ave, DeFuniak Springs, Fla. 32433.

1000 PERSONALIZED Address Labels \$1.00. McAllister, Box 295, Titusville, Florida 32780.

REMAILING SERVICE

FREE 1972 Directory of reliable remailers. Letters mailed from over 100 cities. Send 25¢ for postage and handling to: International Remail-Forwarding Association, Box 1744-P, Miami, Florida 33134.

FORT BRAGG Remails, 25¢ Plus Postage. CEM, Box 1302, Fayetteville N.C. 28301.

CONFIDENTIAL Receiving-Forwarding. Monthly rates. Wright, Box 2112-M, Asheville, N.C. 28802.

WASHINGTON DC Remails 25¢. Receiving-Forwarding. Gabriel, Box 4552, Washington, D.C. 20017.

RECEIVING-Forwarding. Monthly rates. Hedgpeth, 324-M South First, Alhambra, Calif. 91802.

CONFIDENTIAL New York City mail address \$3.00 month. Remails 25¢. Details Free. Birnhan, 152 W. 42, New York City 10036.

SECRET. Receiving—forwarding. Discreet and confidential. Remail 25¢ single. Mail Forwarding Service, 8050 S. Main, Houston, Texas 77025.

TEXAS—Economic, Receiving-Forwarding-Remailing. Nortex, Drawer 5370, Fort Worth, Texas 76108.

DENVER Receiving—Forwarding. 25¢. \$3.00. Details free. Rich, Box 26099, Denver, Colorado 80226.

EXOTIC HAWAII, Remails 25¢ each. \$3.00 Monthly. Dorcliff, Inc., 736 South Street, Honolulu, Hawaii 96813.

FREE Address Stamp to new remail subscribers. \$3/mo. SPECTRUM, 1619 Pineview Rd., Charleston, S.C. 29407.

CONFIDENTIAL. Remails 25¢. Monthly \$3.00. Box 9581, BALTIMORE, MARYLAND 21237.

PARIS London Remailing letters post cards, \$5.00 West. 1403 South Third, Wilmington, N.C. 28401.

CONFIDENTIAL Receiving-Forwarding. Monthly Rates. Davis, Box 5012A, Reno, Nevada 89503.

ATLANTA Remails 25¢. Russell Enterprises, 5336 Denny Drive, College Park, Georgia 30349.

ALBUQUERQUE Remails Single 25¢ Monthly \$3.00. Free Information. 2400 Shasta Rd. S.W., Albuquerque, New Mexico 87105.

RECEIVING—Forwarding. Monthly rates. Milco, 681-J Mt. Washington, Los Angeles, California. 90065.

REMAILING Service South America Receiving Forwarding 50¢ Single. Narvaez, Apartado Aereo 29280, Bogota, Colombia.

LOS ANGELES Remails, 25¢. \$3.00 Monthly. Roberts, 1925 Grace 12A, Los Angeles 90068.

CONFIDENTIAL Remails 25¢. Raibl Enterprises, 2355 Scenic Highway, Pensacola, Florida 32503.

MIAMI BEACH—MIAMI CONVENTION Remails 25¢. Famailco, C-9, Box 543, Miami, Florida 33145.

NIAGARA FALLS Postcards 8for\$2. REMAILS 25¢. Waller, 141 Millicent, Buffalo, N.Y. 14215.

CANADA'S Capitol Remails 60¢. Free details. "Southwick", Rideau Valley Drive, Manotick, Ont. Canada.

MIAMI Remails 25¢. Monthly rates. Lesco, Box 486, Coral Gables, Fla. 33134.

FORWARDING-Receiving 25¢. Monthly Rates. Mosher, Box 2544, Santa Clara, Calif. 95051.

SPECIAL SERVICES

INFORMATION On anything. Ferguson Research Specialists, 83-45 Vietor Ave., Elmhurst, N.Y. 11373.

TOBACCO

PROFITS FROM CLASSIFIED ADVERTISING! Booklet shows you how to start your own business with Classified Advertising. Only \$1.00 (Refundable with first order.) C. A. MARTIN, POPULAR MECHANICS, DEPT. PMP, 224 WEST 57 STREET, NEW YORK, N.Y. 10019.

PERSONAL

PAY Bills! Borrow to \$1500 by mail! Convenient terms! State licensed. Postal Finance, 6018 Military Avenue, Dept. 17-N Omaha, Nebraska 68104.

LAS VEGAS \$500.00 Free. Details \$2.00. Gordon, 815½ Carson, Las Vegas, Nevada, 89101.

SECRET DEBT PLAN Wipe Out All Debts. Get \$600 to \$25,000 relief. Clear credit. Free Details. Counselor-7, Kerrville, Texas 78028.

TATTOO Removing—Chemical Do-It-Yourself Method—Free Details: Atlanta, 907P Beachpoint, Pickering, Ontario.

MAKE YOUR WILL TODAY!! Protect loved Ones!! Blank Will—64 page instructions—Only \$2! Coastforms—1A8, Box 6433, Santa Barbara, California 93111.

WHO Else Wants Credit Cards? Learn how to get credit cards fast, easy! Get new credit without investigation, Box J-27, Hallandale, Florida 33009.

RECEIVE Phony State Chartered University Degrees Immediately. Box 7268, Tampa, Florida 33603.

INSTANT DEBT RELIEF Without borrowing. Without Bankruptcy. Have excellent credit in 45 days. Free!!! Wealth Building, Box 88—8840 Hoyt Drive, Thornton, Colorado 80229.

HOW TO HAVE CONFIDENCE. And POWER with other people. Make them say "Yes" 164 Page Book Reveals Ways. Send \$2.00. Tippi's Gifts, 10325 Lee Hwy., Fairfax, Va. 22030.

REST EASY! Save costly fees. Simple but binding blank Will Forms are self-explanatory. Beware of cheap imitations! Guaranteed—Send \$2.00. Grimco, 2389A Talloak, Sumter, South Carolina 29150.

FAMILY PROTECTION If you die . . . Prepare your will. Binding will form with Instruction Book. Only \$2.00. Guaranteed. Future Enterprises, Dept. C88, 4555 Doyle, San Jose, California, 95129.

BIBLE Questions answered. Stamped envelope. Bylon. 17167 Bentler, Detroit, Michigan 48219.

RECORD Telephone conversations automatically. Leave recorder unattended. Write—Robert's, Box 49-PM8, Parkridge, Illinois 60068.

MAKE YOUR WILL. Get 4 Will Forms and attorney's informative book. \$1.50. Legal Forms Company, Department 124, 1830 Guardian Building, Detroit, Michigan 48226.

PSORIASIS Sufferers: Discouraged? Write for Free important information that is helping thousands! Pixacol, Box 38-PM, Avon Lake, Ohio 44012.

INVESTIGATORS. Latest electronic Aids. Free Literature. Clifton, 11500-P NW 7th Ave., Miami, Florida 33168.

IMPROVE YOUR PERSONALITY, Write for free information: PERSONALITY SUCCESS, Dept. C-15, Box 1946, El Paso, Texas 79950

"RULE Others With Thoughts." (Telepathy) write: Clarion, Box 1769-S7, Chicago, 60690.

HAVE Triple-A credit in thirty days! Get new credit without investigation! Continental, Box J-24, Hallandale, Florida 33009.

CASH LOANS by mail! Up to \$2,500 on signature alone. No collateral! Secret! Union Finance Company, 3608 No. 16th St. Dept. PM, Phoenix, Ariz. 85011.

SMOKING Can Be STOPPED. Money back Guarantee \$1.00. Varner, 132-1 Rolph Drive, Forest Heights, Md. 20021.

4 WILL Forms, Attorney's Instructions. Guaranteed!! \$2.00. Dept. 1P28, Wayman House, 2024 Orchard, Orange, Calif. 92668.

"NERVOUS And IRRITABLE" Relax avoid stress and tension our book will help you. \$1.00. "House of Worth" PM, 95 Kayevue Drive, Hamden, Conn. 06514. Satisfaction Money Back Guarantee.

INTELLIGENT?? I.Q. Revealed in minutes! Self-scoring test—only \$1.98. 3 for \$5. Guaranteed! Getco, Ridgefarm, Illinois 61870.

ACNE? Clear your skin—or pay nothing! Write "CLEAR-A-SKIN", Box 213, Glen Oaks, New York 11004.

RELAX Nervous, irritable? Dr. Gutwirth's 114 page book tells how. Only \$1.00. Emglo & Sons, 8555 Jacaranda Ave., Seminole, Florida. 33542.

BILLS PRESSING? Let us help you now! Not a loan company so bad credit no problem. Write: Budget. 534B Danube, Atlanta, Georgia 30342.

LEARN "27 Ways to improve your I.Q." for just \$2.00; Accurate, self-scoring I.Q. and aptitude tests also available. Amerasian, Box 776CH, La Canada, California 91011.

LOOK! From flat broke to wealth in 30 days. Information Free! Rosebud's, 1902 Center, Crest Hill, Illinois 60435.

WILL Making Booklet and Forms \$2.00. Regal, Box 182, Mt. Pleasant, S.C. 29464.

ASTROLOGY, Thousands Amazed With Prepared Horoscope. If Not Afraid Of What You May Read, Send \$1.00. Name, Birthdate, Addressed Stamped Envelope. Zoro, PM-Dept., P. O. Box 24739, San Jose, California 95154.

NEVER Wax your car again! Free sample world's finest auto polish. Mike's Miscellany, Box 232, Dept. B8, Montgomery, Illinois 60538.

LUCKY Number Forecast. Enclose \$1.00. Name, Birthdate, Addressed Stamped Envelope, S. O. S., PM-Dept., P. O. Box 24739, San Jose, California 95154.

RESTORES YOUTH, Vigor! Fantastically easy, fast, effective new nutrition plan! Only \$3. Guaranteed! Limited offer! Order today! Meg Stuart, Box 662-H, NYC 10022.

STOP SMOKING Guaranteed Results in 16 Days Limited Supply Send \$2.00. Lab, Box 1582 P, Mansfield, Ohio 44907.

(Continued on next page)

PERSONAL

(Continued from preceding page)

DIE YOU WILL!! Protect your family with simple blank form. Guide. Guaranteed! Send \$2.00 today! DobbCo, 16026 Carleton, Dept. 288, Fountain Valley, Cal. 92708.

NEW "INSPIRATION CARDS" Set of 18, each one a Key to Success! Only \$3.75. Max Moser Enterprises, Box 1102, San Fernando, California 91342.

WANTED-MISCELLANEOUS

MERCURY Gold, Silver, Platinum; Ores assayed. Wholesale Terminal, Norwood, Mass. 02062.

MISCELLANEOUS

CUSTOM Blended Pipe Tobacco—finest tobaccos, expertly blended, factory fresh. Write for free samples. Green River Tobacco Company, Since 1914, Box 991, Owensburg, Kentucky 42301.

MUSHROOM LOVERS Save money—learn new ways to find, purchase, freeze, dry, can, cook mushrooms \$2.00. Donna Myer, Box 856M, Battle Creek, Michigan 49015.

LIQUEUR Liqueur recipes 4 favorites 2.00. Box 5220, Oakland Calif. 94605.

STOP Fumbling for keyholes! Miniature key light fits any key! Self contained power source. Ten day guarantee. Send \$3.95 plus 50¢ postage and handling. House of Bradford, Dept. 1C8, 7 Myles Standish Drive, Bradford, Mass. 01830.

SOCIAL Security Plates \$2.00. Send Name, Address, Number and Stamp. C. O'Hara, Box 16334, Shively, Ky. 40216.

MAKE Your Will. 4 will forms, informative booklet, show Why and How. \$1.50. Guaranteed! Panama House, Dept. 22, Box 3118, Panama City, Florida 32401.

BOOKS On antiques and their prices. Free circular!! P. Warman Publishers, Uniontown, Penna. 15401.

PLANNING To Buy A Home? Determine Monthly, Down Payments With FREE Mortgage Payment Calculator. Send 25¢ postage, handling. Gray, 3611X Bridge Manor, Kansas City, Missouri 64137.

ONE DOLLAR—Buys engraved metal Social Security plate. Please print. Variety Sales, P.O. Box 59, Vinton Va. 24179.

WOODEN Nickels 10¢ each. 50¢ Minimum. Dynamic Sounds, 1404 Grant, Denver, Colorado 80203.

SACK Of Hops. Plus Wine Yeast. With 101 Winemaking And Sourdough Recipes, Including Catalog—Send Only \$1.00. Nichols Hops, 1190PM North, Albany, Oregon 97321.

WINEMAKER'S Supply Catalog—Free. Bacchanalia, 273 Riverside Ave., Westport, Conn. 06880.

WINEMAKERS!! Fermentation locks—3/\$1.00. Free Illustrated Catalog Plus \$5.00 Credit Coupon. Werth Wine, Box 1902AV, Cedar Rapids, Iowa 52406.

WINEMAKING Kit—\$4.98 Free Catalog and Recipes. JIMDANDY, Box 30230M, Cincinnati, Ohio 45230.

SUFFERING From Arthritis? Try Ginseng; Information Free. Write Ginseng, Asheville 53, North Carolina.

WINEMAKERS Yeast, Recipes & Catalog 25¢; Kraus, Box 451-L, Nevada, Missouri 64772.

ORNAMENTAL Iron designs. Book of 1600 beautiful, practical designs for railings, columns, etc. Free literature. Cunningham, 3881 South 3200 West, Salt Lake City, Utah 84119.

WINEMAKERS. Free illustrated catalog of yeasts, equipment. Semplex, Box 12276, Minneapolis, Minn. 55412.

WINEMAKERS. . . . Free Illustrated Supply Catalog of Yeasts, Equipment, Recipes. Winemaker, Box 11211-PM, Indianapolis, Ind. 46201.

CREDIT Cards! Receive all kinds fast, easy. Get new credit without investigation! Continental, Box J-23, Hallandale, Florida 33009.

WINEMAKERS: Free informative catalog, recipes. Arbolyn, Box 663, West Columbia, S. C. 29169.

PRE-PACKAGED Toys complete with free self-selling display rack. Free Details. Toys, 1916 Fifth, Sacramento, California 95814.

SOLID Gold-Plated Eisenhower Silver Dollars 1971 or 1972 \$2.95. Owen Cox, 514033 U.S. 31, South Bend, Indiana 46637.

BIRTH Certificates, Marriage Certificates, Diplomas! 2 blank forms \$1.00. Sample 10¢. Standard Forms, Box 482-M, Washington, D.C. 20044.

SLEEPATRON. New device for inducing sleep. Gardiner Electronics, Dept. C, 4729 North 7th Avenue, Phoenix, Arizona 85013.

HOMEWINE MAKING SUPPLIES And **INGREDIENTS CATALOG** With **RECIPES** For Year Round Winemaking. It's A Fascinating Hobby. We Also Have Supplies And Concentrates For Your Wine Kit. Send For Free Catalog. Danenberger, Box 276-M, New Berlin, Illinois 62670.

SAVE 50%. New books, guaranteed, free catalog, Enterprises, Silver Lake, Minnesota 55381.

ATTENTION WINEMAKERS! Make delicious grape, cherry, elderberry wines & champagne. Recipes \$3.00. Arnold, Box 94307, Oklahoma City, Okla. 73109.

WOOD BARRELS AND KEGS. Wine Barrels, Oak Planters. Send 25¢ For Illustrated Catalog. Cordell Enterprises, 1622 West Morse, Chicago, Illinois 60626.

DON'T Die without a will! Instructions, Blank Will Forms, and Pen! \$2.00 Guaranteed! Order today! Sheller, 2446 Birch Street, Easton, Pa. 18042.

LOOK!! VERSALIGHT is a portable battery operated light that gives to 1200 hours bright fluorescent light!! Use anywhere. Rechargeable battery included. Guaranteed. Order today!! \$37.50 Sharbono Enterprises, 214 Main, Box 106A, Stevensville, Mont. 59870.

CHAMPAGNE Also make wine with your own utensils complete instructions 2.00. Box 611, Hopkins, Minn. 55343.

WINEMAKERS: Free Catalog. Intepace Winery, P.O. Box 11186, Phoenix, Arizona 85017.

WILL Forms! Necessary For Family Protection!! Instruction Booklet with Five Forms! Only \$1.00—Guaranteed!! KB Sales, 489 Court Street, Dept. 1AB8, Brooklyn, N.Y. 11231.

FRIGHTEN BURGLARS AWAY The whole time you're out! **PLAY-IT-SAFE** System makes automatic phonograph repeat special conversation record continuously. Only \$6.98. 7-day moneyback trial, Penta (3B8), 13 East 9th Street, New York 10003.

MEN'S Hairpieces made by hand to specification of 100% Italian Human Hair. From manufacture to customers a \$300.00 hairpiece for only \$99.00. This hairpiece comes to you prestyled, ready to wear with 7 day money back guarantee. Write for complete information to: Classico Mfg., 256 N. 6th St., Steubenville, Ohio 43952.

BECOME Successful Wine-Champagne Maker! Easy Directions. Use Kitchen Utensils. Guaranteed. \$1.95. Win-net, Box 15423, Lakewood, Colo. 80215.

CIGARETTES 15¢ a pack. Improved roller makes 20 filtertip, plain, king or regular for 15¢. Facts free. Green River Tobacco, Box 954, Owensboro, Kentucky 42301.

GUARANTEED Delicious Wine & Champagne Recipes using standard kitchen items. Send \$3.98. Moll Enterprises, Box 5271, Grosse Pointe Farms, 48236, Michigan.

LICENSE: — Driver — Birth — Marriage — Karate — Judo — Mechanic — Locksmith — Upholsterer — Carpenter. Diplomas: — High School — College — Technical. Rushed Airmail!!! Two—\$1.00. Deluxe "Goldseal" Documents \$1.00 each. Moneyback Guarantee!!! Samples 10¢. Filiforms, Box 1332-BG, Albany, New York 12201.

WINEMAKERS Our Vintners Proven Methods, Time Tested Recipes and Supply Catalog \$1.00. Vintner, Box 6110, Pomona, California 91769.

BEFORE YOU DIE!! Make a will. Protect your family 2 forms original, duplicate Only \$2.00 Guaranteed! Order today!! L-B Sales, 316 North River Street, Aurora, Ill. 60506.

IDENTIFICATION Cards, Send stamped self-addressed envelope for samples. Nipcom, 727 North Main, Las Vegas, Nevada 89101.

SAVE A Tree! 100% recycled stationery. 24 note sheets, envelopes only \$1.50 box. White or "Earth" colors. Postpaid. E.T. Claires, 36EB-1409 South Harrison, Grand Island, Nebraska 68801.

SAVE 1/2 to 1 1/2 gallons water each toilet flush. Nothing to buy. Instructions \$2. Send large addressed envelope. D. Walke, Elkader, Iowa 52043.

NEW. Approved Mailbox Tray. Fits all suburban mailboxes. Tested. Guaranteed. Durable plastic. \$2.95. M&M Specialties, 405 Bluff Court, Benton Harbor, Michigan 49022.

LOSE YOUR KEYS? Home, Office, Car, Boat, Home pick a lock kit \$2.95. Wagars, 169 Clover Dr., Upper Lake, Calif. 95485.

WINNERS Methods Guaranteed any type gambling Details 10¢. Winners, Box 7225, Kansas City, Mo. 64113.

DON'T PAY INCOME TAX. Legally. No matter what your income. Rich men's methods adapted for anyone's use. Free Details. Treehouse 34, Box 3004, Duluth, Minnesota 55803.

HEARING Aid batteries wholesale. Free list. Habs, Box 51, York, Penna. 17405.

WINEMAKERS—New illustrated catalog of supplies and equipment. Wollersheim Winery, Prairie-du-Sac, Wisconsin 53578.

BURGLAR ALARMS & HOME PROTECTION

STOP Burglaries Outstanding chain burglar alarm scares intruder. It's battery operated only \$4.98. J. C. Cooper, 1605-C Stetson, Modesto, Calif. 95350.

DOUBLE Protection. Chain doors windows. Alerts with loud alarm. No wiring. Battery operated. \$4.95 each. \$1.00 postage. Benefields, 2916 Elmhurst, Oklahoma City, Okla. 73120.

FREE Catalog on Burglar-fire Alarm Equipment. Protecto Alarm Sales, Box 357-D, Birch Run, Michigan 48415.

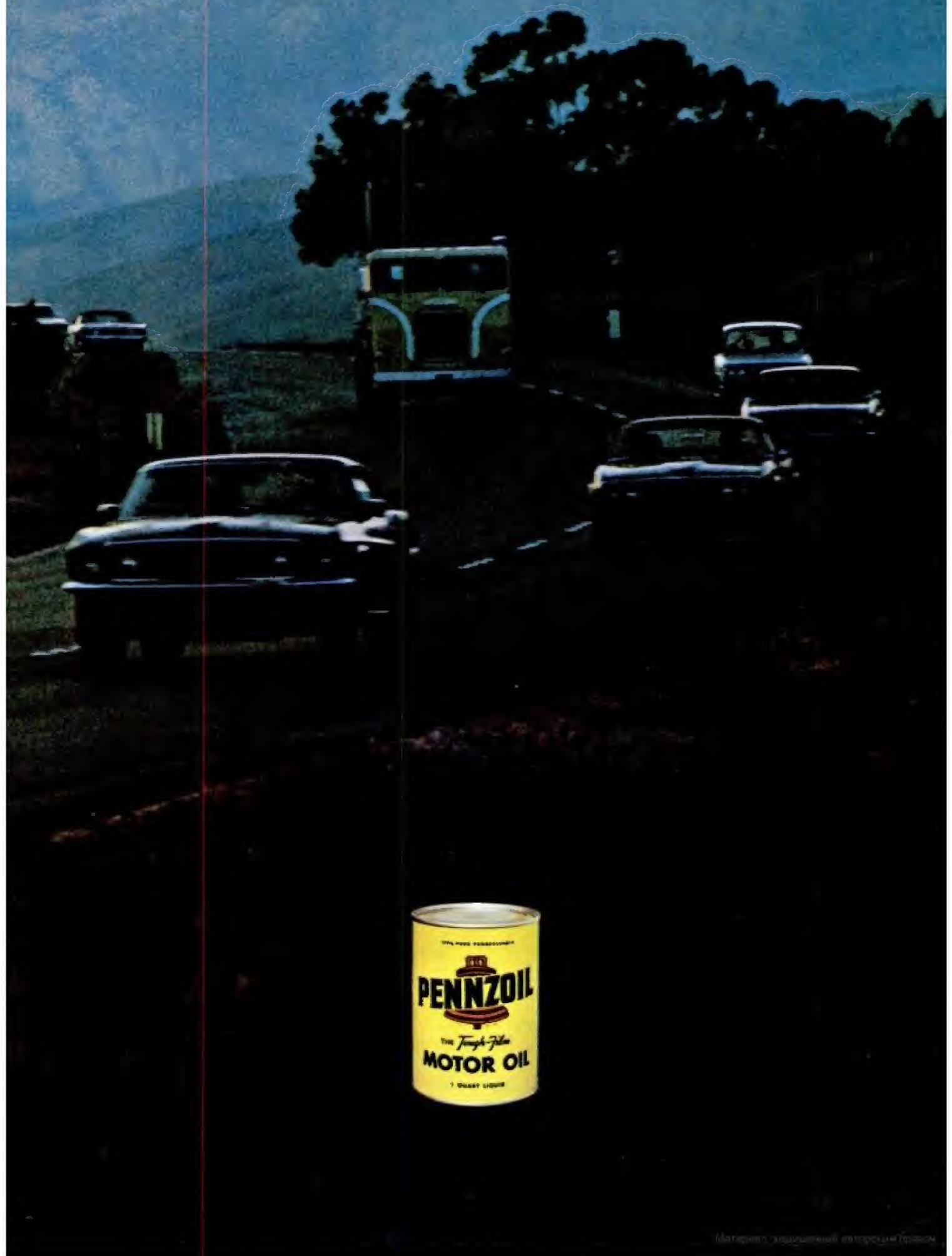
ALARM SYSTEM Plans for building any of 7 different Burglar and Fire Alarms. Two **EMERGENCY POWER SYSTEM** Plans for Lighting Inside Outside Home, and Alarm Backup, using Storage Battery During Power Failures. Complete set \$4.00. **AMERICAN CONFLUX, Inc.**, Box 5704M, Redwood City, California 94063.

STOP Burglaries! Protection For Doors, Windows. No Wiring. Battery Operated \$5.95. E. Johnson Co., 97 Grandview Ave., Great Neck, N.Y. 11020.

BLASTER BURGLAR ALARM. Alerts whole neighborhood up to a mile—homes—trailers—campers—cabins. \$29.95. **BERALCO**, P.O.B. 16211, Portland, Oregon 97233.

ANTI-BURGLARY Protection plan—proven amazingly effective. Free details. Write Arnson & Assoc., 6427 Fairlane, Indianapolis, Ind. 46259.

Whatever you drive, wherever you go,
Pennzoil is worth asking for.



Latest U.S. Government figures show

Pall Mall Gold 100's lower in 'tar' than the best-selling filter king!



Yes, longer yet milder.



PALL MALL GOLD 100's... "tar" 18 mg.—nicotine, 1.3 mg.
Best-selling filter king..... "tar" 20 mg.—nicotine, 1.4 mg.
Of all brands, lowest..... "tar" 1 mg.—nicotine, 0.1 mg.

18 mg. "tar", 1.3 mg. nicotine av. per cigarette. FTC Report APRIL '72.